FOREST STEWARDSHIP PLAN

for

Frederick City Watershed
also known as
Frederick Municipal Forest

c/o City of Frederick
Dept. of Public Works
111 Airport Drive East
Frederick, MD 21701

Location

East Side of Catoctin Mountain,
Six Miles Northwest of the City of Frederick

Maryland Grid
North 620, East 665

Latitude/Longitude
North 39° 32'
West 77° 29'

In

Frederick County

On approximately
7022 acres Total
including:
7006 acres Forest
16 acres Fields

Prepared by:
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Paul Eriksson, RC&D Watershed Forester

April 2005

AKNOWLEDGEMENTS

The preparation of this plan took several years to complete, and involved the hard work and skill of a number of personnel from the Maryland Dept. of Natural Resources - Forest Service, including: Bryan Seipp, who began the preparation of the plan and directed the data collection and mapping during the first year, Georgia Guyton, whose contributions to the data collection and mapping through the first two years were invaluable, and Elizabeth D'Imperio, Andrew Mishler, Aaron Cook, and Cody Miller, who at various times assisted with the data collection, mapping and data processing.

Individuals or agencies that contributed to certain portions of this plan are credited in that section.

Thanks are due to Donald Rohrback, Wildlife Biologist with the Maryland DNR Wildlife and Heritage Service, who provided a great deal of assistance and input.

The U.S. Forest Service, through the Potomac Watershed Partnership, provided funding that made this project possible.

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PURPOSE OF THIS PLAN

This Forest Stewardship Plan is provided to the City of Frederick as a guide to forest management on the property commonly referred to as the Frederick City Watershed. This plan is intended to aid in the management of the land, the forest, and associated resources in a manner that will meet the objectives for the property in a balanced manner.

OBJECTIVES

A. Primary

1. To maintain and improve the watershed as a source of high quality water.

B. Secondary

2. To continue protection of the watershed from the detrimental elements of wildfire, insects, disease, and erosion.
3. To provide high quality fish and wildlife habitat on a continuing basis.
4. To manage the forestland to provide sawtimber and other wood products on a continuing basis.
5. To allow limited educational use of the land as a means to better appreciate and understand our environment.
6. To provide recreational opportunities to the public in accordance with the enclosed city ordinance.
7. To maintain the aesthetic integrity of the forest along major travel routes, streams and other critical areas.
8. To protect populations and critical habitat for rare, threatened and endangered species of plants and animals.

The first 7 objectives above were developed by staff of the Maryland Dept. of Natural Resources and the City of Frederick, and the Parks, Streets and Sanitation Committee of Frederick, for use in the previous plan completed in 1980. These objectives are as sound and relevant today as they were then. Based upon discussions with staff of City of Frederick Dept. of Public Works, MD DNR Forest Service, and MD DNR Wildlife and Heritage Division, the 8th objective relating the RT&E Species was added, the order was adjusted, and the following clarifications and elaborations were produced.

1. Water Quality
    a. Serve as a supply, current and future, of potable water for the City and surrounding areas.
    b. Provide high quality water and aquatic habitat conditions for living resources within the Frederick City Watershed.
    c. Contribute clean water for downstream uses and benefits, including the Monocacy River, Potomac River and the Chesapeake Bay.

2. Forest Health
    a. Monitor populations and conditions that promote damage from wildfire, insects, diseases, and invasive exotic plants and take measures to prevent damage when appropriate.
    b. Create a diversity of tree species, sizes and age classes to minimize catastrophic loss from insect or disease outbreaks.

3. Wildlife Habitat
    a. Provide quality habitat for a variety of game and non-game species of fish and wildlife.
    b. Keep wildlife populations in balance with habitat conditions.

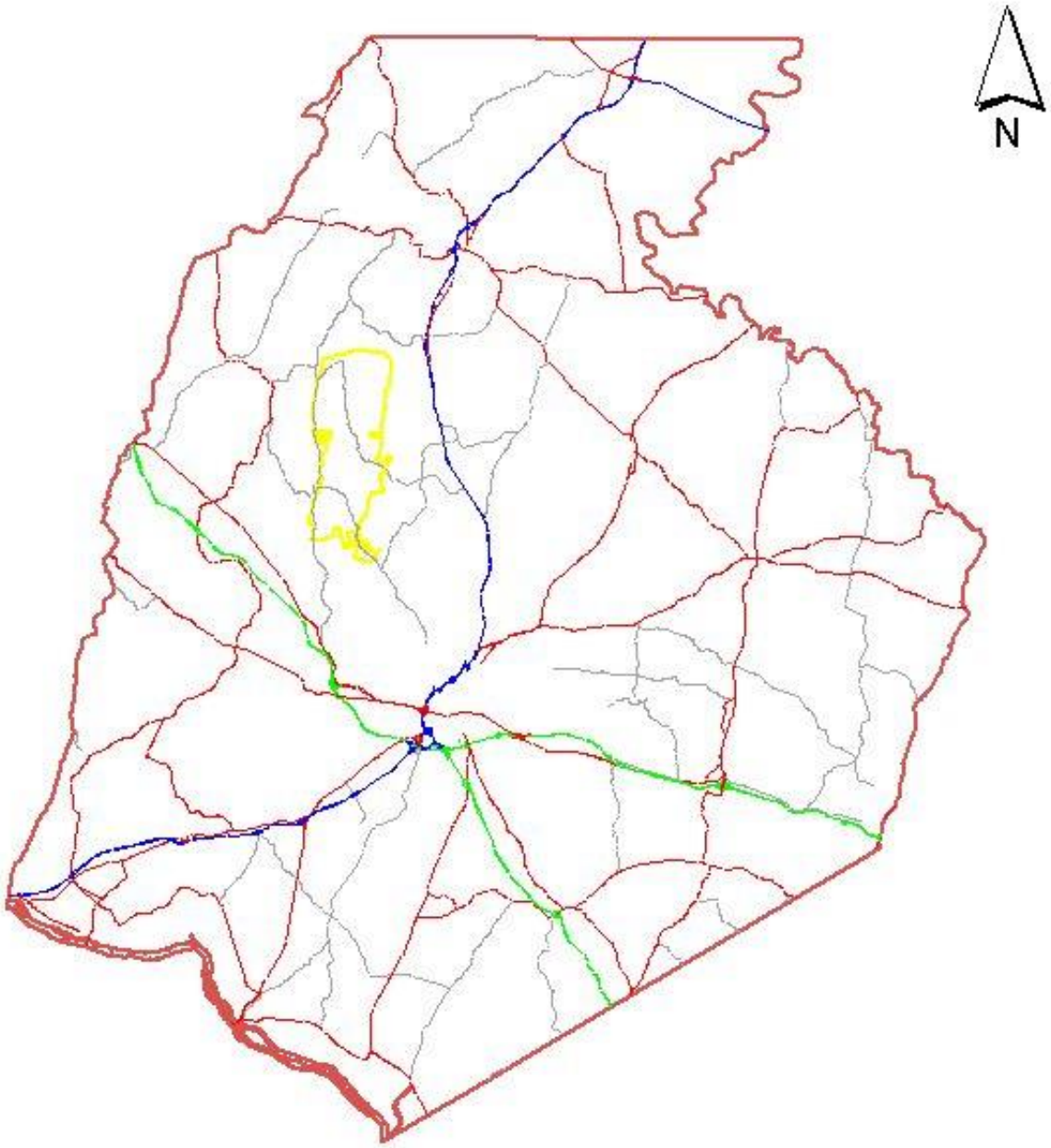
4. Forest Products
    a. Produce forest products in a sustainable manner to provide for local needs, benefit the local economy, and produce income to offset other management expenses.
    b. Use harvesting of timber, where appropriate, to address other management objectives such as wildlife habitat modification, wildfire hazard reduction and susceptibility to forest pests.

5. Education
    a. Provide opportunities for outdoor education for the general public and schools.
    b. Provide opportunities for research and demonstration of watershed management, forest ecology, forestry, wildlife management, and related topics.

6. Recreation
    a. Provide opportunities for public recreation such as hunting, fishing, hiking, bird watching, mountain biking and horseback riding.
    b. Prevent or minimize activities that are incompatible with other objectives of the plan or are unlawful, destructive or hazardous.
7. Aesthetics
    a. Minimize visual impacts of harvesting, mortality from insects and disease, and other effects, especially adjacent to main travel corridors and other public use areas.

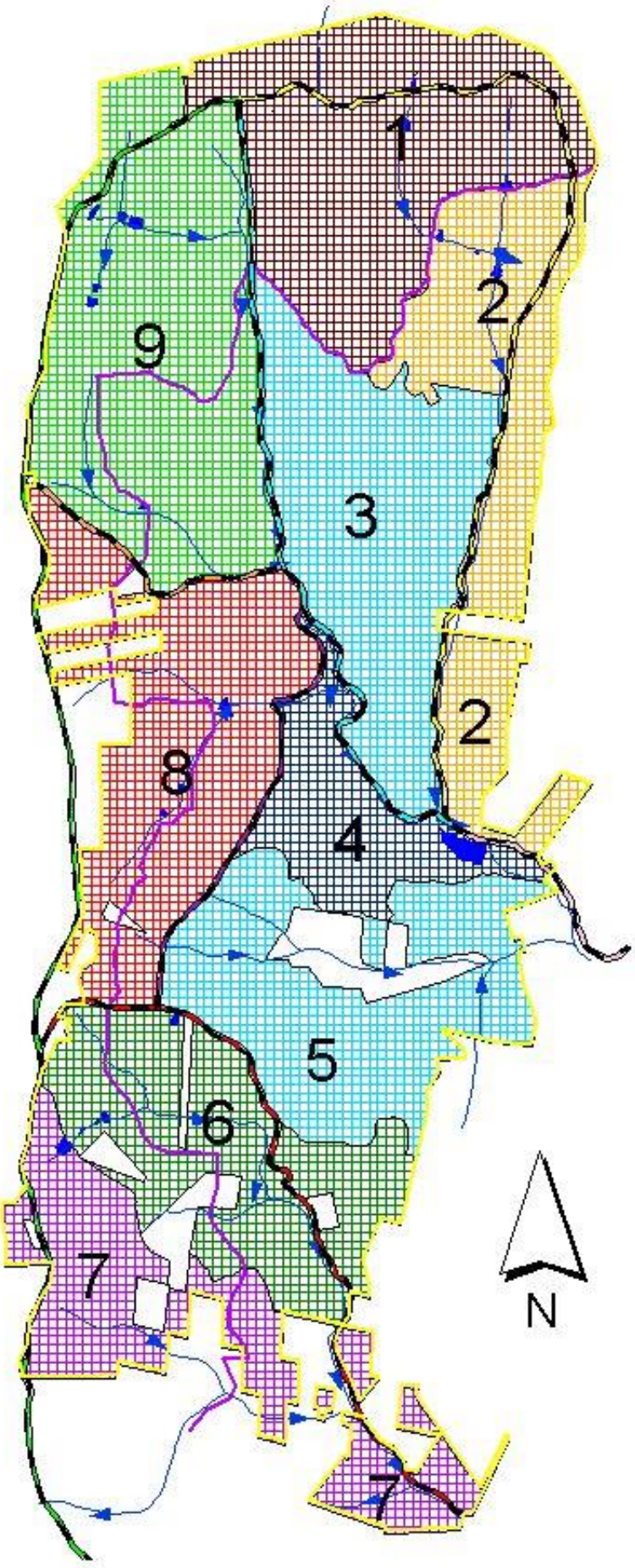
8. Rare Threatened and Endangered Species
    a. Protect RT&E species from disturbance that may affect long-term survival
    b. Provide for the maintenance and perpetuation of critical habitats for RT&E species.

FREDERICK WATERSHED LOCATION



Frederick County Major Roads
Interstate Highways
Major County Roads
State Primary Highways
State Secondary Highways
City Watershed Boundary

GENERAL MAP

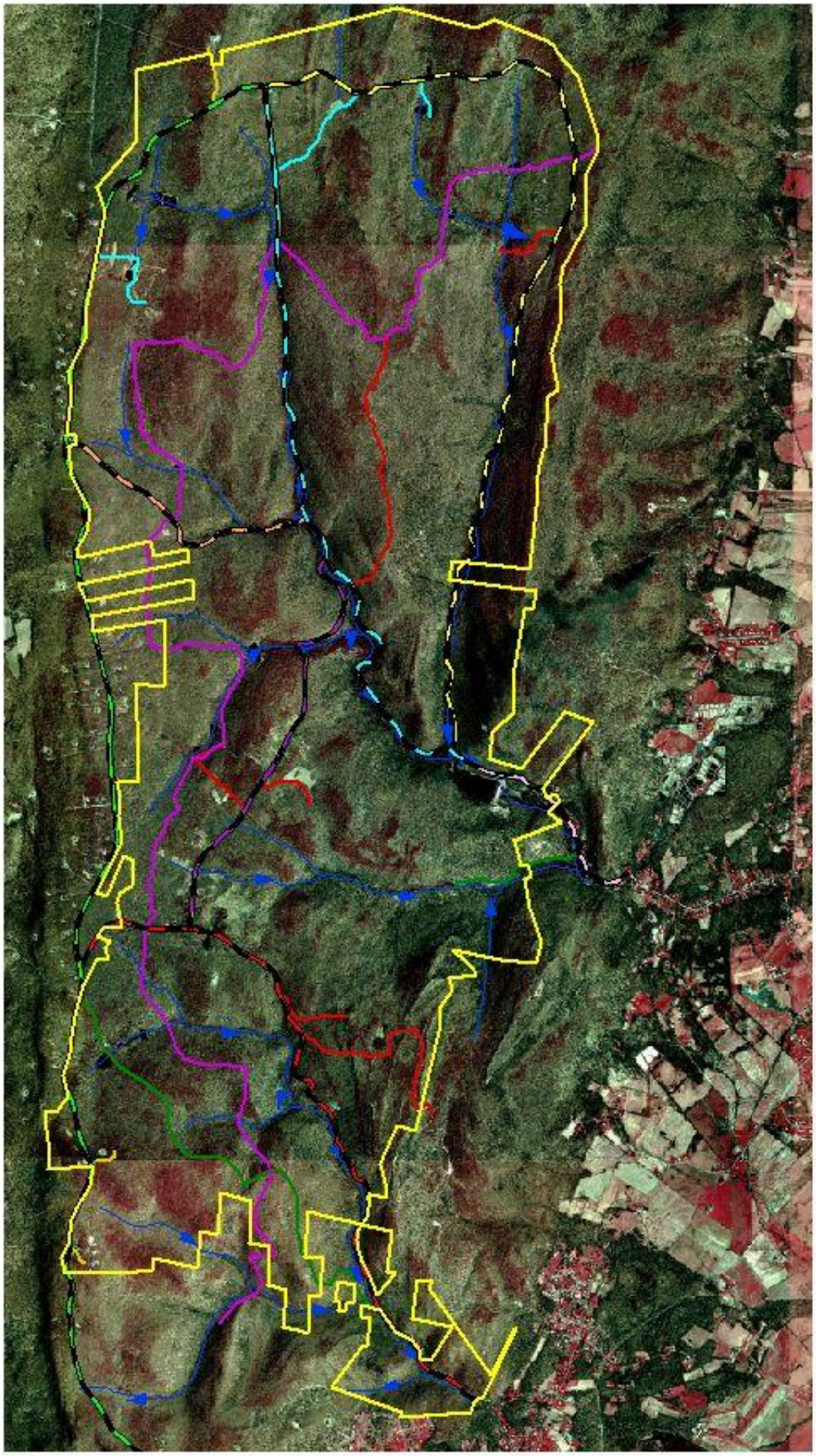


LEGEND

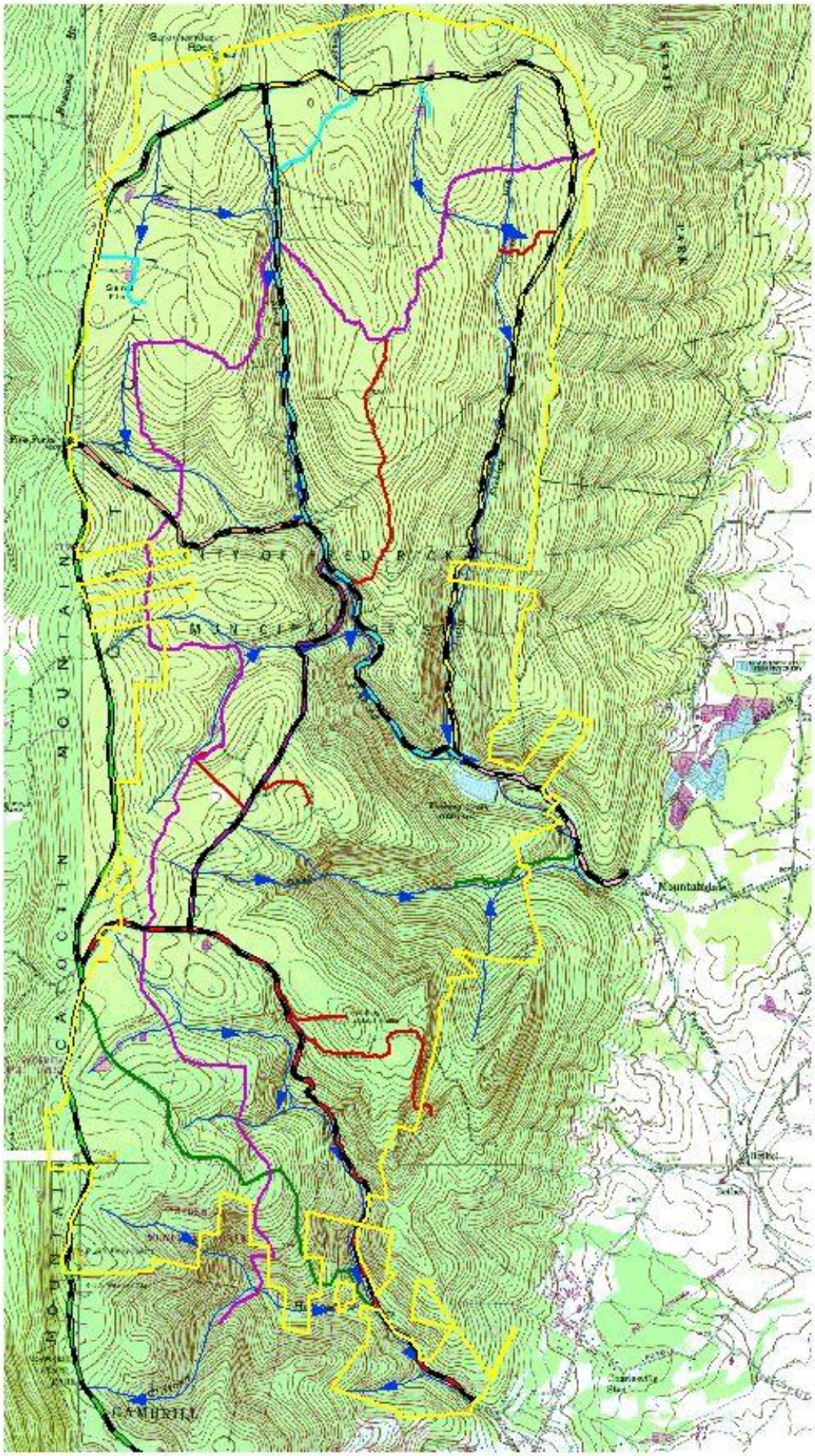
City Watershed Boundary
Left Hand Fork Rd
Gambrill Park Rd
Right Hand Fork Rd
Mountaindale Rd
Delauter Rd
Fishing Creek/Cold Deer Rd
Hamburg Rd
Roads and Trails
Hiking
Streams
Ponds/Lakes
Compartments
Inholding
1
2
3
4
5
6
7
8
9

FREDERICK CITY WATERSHED

AERIAL PHOTOGRAPHY



TOPOGRAPHIC MAP



N

City Watershed Boundary
Left Hand Fork Rd
Gambrill Park Rd
Right Hand Fork Rd
Mountaindale Rd
Delauter Rd
Cold Deer Rd
Hamburg Rd

Roads and trails
Fire
Hiking
Private
Radio
Wildlife
Streams

HISTORY

Natural History

The forest in this area developed gradually over the last 10,000 years, following the last ice age. At that same time Native Americans arrived, bringing with them fire as a tool for managing vegetation to promote habitat for certain game species and to facilitate hunting. Elk and bison almost certainly roamed the larger valleys and piedmont in Frederick County. We will never know for sure the extent of Native Americans' effect on the forests, but it is probably greater than previously recognized, and there is reason to believe that our eastern hardwood forests evolved under a fire regime. Following the great die-off of the Native American population in the 1500's and 1600's due to introduction of European diseases, the impact of fire diminished for a time, allowing regeneration of trees in previously open areas.

Early settlement by European peoples was directed more toward the arable and accessible lands in the eastern and southern part of Frederick County, so there was little impact on the vegetation of the Catoctin Mountains. Gradually, as settlement intensified after the American Revolution, the more marginal tracts in the mountain areas were settled. The forests were utilized for fuel, timber, and fencing, and were used as pasture for cattle and hogs. Fires for land clearing escaped without any serious effort to control them, and fires were deliberately set to improve pasturage and blueberries.

In the late eighteenth century and throughout the nineteenth century, the area in the northern part of the watershed was harvested to make charcoal for iron production at nearby Catoctin Furnace (1776-1903), and possibly for lime kiln operations such as the one at Fountain Rock near Walkersville. The forest was clearcut, probably repeatedly over a long period of time. In this same period, the growing population in Frederick County created a demand for more wood products. The area that is now the Frederick City Watershed probably provided quantities of easily-worked white pine lumber and chestnut timbers to build the farmhouses and barns of Frederick County farms and the homes and commercial buildings of the City of Frederick, and chestnut rails were used for farm fences and oak used for firewood and barrels. In the early 1900's, much of the Watershed was again logged to supply the Stave Mill Company, also located at Catoctin Furnace.

In the late 1800's and early 1900's the large amounts of blueberries and huckleberries on the watershed supplied a crop for the local residents, both for personal use and sale. Local residents periodically set fire to the undergrowth in the forest with the purpose of improving the growing conditions for berries. In the same time period, there were a large number of American chestnut trees on the watershed that produced valuable wood products and nuts, until 1918 when the chestnut blight all but wiped out the chestnut timber in the area. There are still root sprouts emerging from the chestnut trees killed many years ago. Other species, particularly chestnut oak and scarlet oak, increased in number to fill the void left by the demise of the chestnut.

In the 1920's and 1930's support for forest fire suppression began to take hold. Forest Wardens were appointed in each county and fire crews were organized. In 1930, a forest fire broke out on the Watershed. This fire was the largest ever recorded on the Watershed, burning over 2,500 acres of timber. The fire started in the Hamburg Road area and was finally put out in the area of Buzzard Rocks. This fire burned for 10 days and was very hard to control. In the 1940's and 1950's increased resources for fire prevention and suppression, along with changes in local attitudes toward fire, drastically reduced the number and severity of forest fires in the area.

In 1983 gypsy moth, an exotic insect pest, appeared on the watershed with a rapidity and intensity unanticipated by the Maryland Dept. of Agriculture, the department that was monitoring and attempting to control the approaching population. Extensive defoliation by the caterpillar stage of this insect during each of the next several years, aggravated by drought conditions and limited funding for spraying, created a condition that allowed secondary pathogens such as the Two-Lined Chestnut Borer and Shoestring Root-rot Fungus to kill the majority of the oak trees on the property. Since at that time the forest on the Watershed was mostly oak, and most of the oaks were killed, the loss was tremendous. More recently the Hemlock Wooly Adelgid, another introduced exotic insect pest, has damaged many of the hemlock trees found on the Watershed.

Another factor that has affected the forest on the Watershed is the rise in the deer population over the last 30 years. Fortunately the significant amount of hunting on the Watershed keeps the population in control to a greater degree than in most areas, though the impact of deer on regeneration of desirable tree species and on native herbaceous vegetation is still a consideration.

The history of fire favored the development of a forest that was dominated by oaks, American chestnut and pines, with red maple, hemlock, and black gum relegated to a minor role, mostly in the lower, wetter areas. Preferential harvesting of white pine for lumber probably diminished that species' population. Effective suppression of forest fires in the last 40 years resulted in a decrease in the competitive advantage of oaks, reduced the conditions favorable for regeneration of pines, and allowed the development of an understory of shade tolerant red maple, black gum, and black birch. When released by the mortality of the oaks due to gypsy moth, this resulted in a forest dominated in many areas by these shade tolerant trees.

The forest that is present on the Watershed has been in continuing process of change for thousands of years. It has been, and continues to be, acted upon by all sorts of forces. There is no "climax" forest community that we can point to and say that this is the natural state that the forest should be in. Probably the best approach is to create conditions where the forest represents a diversity of species with a range of tree ages and sizes that meet the objectives for the property.

City Ownership and Water Supply History

The first parcel of ground for the Fishing Creek Watershed was purchased on May 12, 1870. This parcel and several other small parcels were purchased and several parcels were leased during the next several years. In 1899, the first dam (known as The Little Receiver) was constructed. The Mayor, at that time, was William F. Chilton and the Engineer was John Pownall. The contractors for this project were Henry L. Hammrick and George W. Geasey. The project consisted of a small dam and a filter building. It was started May 8,1899 and completed August 9,1899. This small dam and building exists today but are not used in the water system. These structures are located in the park or picnic area just east of the large dam and reservoir used today. At the same time (1899) the first water main from the City of Frederick was installed. It consisted of 18, 840 feet of 12-inch pipe. The excavation for this pipeline was done using horse-drawn scoops and hand labor. In 1929 an 18-inch pipeline was laid parallel to the original 12-inch line. The timbering and clearing for the present dam and reservoir were started in 1923. The actual construction was started in 1924 with the dedication in 1925. The Mayor of Frederick, at that time, was Lloyd C. Culler and the City Engineer was Emory Crume. The contractor was Consolidated Engineering Company of Baltimore, Maryland. The original dam and reservoir were built to hold 60 million gallons of water.

In 1933 the earth filled dam was raised to hold an additional 17 million gallons of water. This remains today with a total capacity of 77 million gallons when full to the spillway. The present dam height is 44.0 feet above the stream level with the top of the dam being 719 feet above sea level. In 1959 a leak appeared in the dam in the area of the tunnel. The reservoir was drained June 24,1959 for repairs. At the completion of the repairs, the tunnel was closed and it took 277 days for water to flow over the spillway. The quality of water from this source is very good and needs only screening and chlorination as compared to other sources of water used by the City of Frederick.

The largest parcel of ground that was purchased by the City of Frederick was bought February 28, 1927 from Stanley E. Hauver and Wife, and the Potomac Hill Development Company owned by Lancelot Jacques, Sr. This parcel contained 3,178 acres and makes up most of the northern end of the watershed. Another large parcel was for 1,287 acres from the W. D. Bowers Lumber Company on September 9, 1914. The balance was purchased in smaller parcels over the years. In 1935 a large portion of mountain land in the south end of the watershed was conveyed to the State of Maryland by the City of Frederick. Today we know this area as Gambrill State Park.

Much of the historical information above on City ownership and water supply was drawn from the previous Woodland Management Plan circa 1980 prepared by Ronald Antill and others.

Forest Management History

Timber harvesting, hunting, charcoal burning, and similar practices have been taking place on the Watershed since colonial times. No scientific resource management would have taken place until at least the early 1900's.

In the early 1900's Fred W. Besley, Maryland's first State Forester, visited the area as part of his survey of the forests of Maryland. Forester Besley reported, "I'd hire a horse and buggy at a livery stable and jolt out along the dirt roads as far as possible and then on foot follow the cow paths up through the woods … ". He usually got acquainted with the local landowners, and introduced the idea of forest management. As an active proponent of the use of managed forestlands for the protection of municipal water supplies, he likely had an effect on the City's decision to purchase and manage the Watershed.

In the years 1933 –1938, a Civilian Conservation Corps (C.C.C.) Camp (Camp S-57, Company # 2302) was operated on the Frederick City Watershed. This camp was built along both sides of Mountaindale Road, not far below the reservoir, and included barracks, a mess hall, and a headquarters building (which are now gone), and a recreation hall, superintendents cabin, and sawmill (which are still present). The camp was manned by 200 C.C.C. boys, who may be credited with building over eleven (11) miles of roads and seventy-five (75) miles of fire trails, and planting many acres of pine trees on previously farmed fields, as well as building many of the facilities at Gambrill State Park. The Maryland Forest Service provided personnel to advise, train and assist the C.C.C. in forestry, forest fire preparedness, and other conservation projects on the Watershed.

The C.C.C. era Frick circular sawmill was operated for many years by the City of Frederick, which supplied lumber for bridge planks, excavation shoring, fencing, park benches, picnic tables and picnic shelters. Scattered large trees in accessible areas were cut by City crews and sawn at the mill. This mill is still there, and appears to be in fairly good condition, but has not been used for a number of years.

There are thirteen small earth-dam water storage ponds throughout the watershed to retain water for fire protection, wildlife and other uses. There are a number of small fields, maintained as permanent wildlife openings, typically less than five acres in size scattered throughout the watershed to provide a diversity of habitat conditions. In some of these fields cultivated wildlife food plots are located.

Throughout the City's ownership of the property at the Watershed, they have utilized services of the various agencies of the Maryland Department of Natural Resources. Foresters of the Maryland Forest Service provided periodic assistance with timber management. Forest Rangers of the Maryland Forest Service stationed at nearby Gambrill State Park have long been involved in the prevention and control of forest fires on the Watershed. Hamburg Tower, a forest fire lookout tower, was located in the south part of the watershed. The Fisheries Division regularly stocks and monitors fish populations in the larger streams. The Natural Resources Police provide enforcement of hunting and fishing regulations. The Wildlife and Heritage Division has for many

years provided advice and assistance to the City on management of game and non-game wildlife and rare, threatened or endangered plants and animals. In 1979 the City signed a lease agreement with DNR Wildlife Division, establishing the Watershed as a Cooperative Wildlife Management Area. Under this agreement the Wildlife Division administers the property for public hunting and other recreational activities.

The first formal forest management plan was prepared for the City by the Maryland Forest Service, in cooperation with the Wildlife Division, in 1980. Along with recommendations for addressing each of the various other objectives, the plan included recommendations for timber harvests, improvement cuttings, thinnings, etc. that would eventually help balance the species composition and age class distribution. Work began the following year (1981) with a 150 acre timber stand improvement cutting.

Unfortunately, shortly after the first forest management plan was prepared the gypsy moth arrived with unexpected rapidity and severity, eventually resulting in mortality of most of the oak trees on the property. At that point the existing plan was no longer valid, and work concentrated on salvage cutting to recover some of the value and utility of the dead and dying trees, reduce fire hazard, and to try to create conditions for regrowth of desirable species. Most of the salvage harvest areas were clearcut, though in some areas scattered large trees were left behind. The silvicultural results of the harvesting were favorable, with a greater diversity of tree species, and a greater regeneration of oaks, in the stands that were harvested, as compared to the non-harvested areas where three shade-tolerant and low-value species (black gum, red maple, black birch) make up almost all of the regeneration. During a seven-year period, from 1985 to 1991 a total of 546 acres were harvested, producing an estimated 11,950 cords of wood, and generating $156,768 for the City. Due to the fact that the trees were mostly dead, and many were small, the wood was mostly used for firewood. Most of the area harvested was in lots of 1 to 5 acres in size, and were cut for firewood by homeowners in the Frederick area. Many stands that probably should have been harvested were not, due to logistical and market limitations. The value lost to the City from the gypsy moth defoliation was probably millions of dollars in potential revenue.

Salvage harvesting was phased out in 1991 due to the deterioration and decay of the wood and the risk from the large number of falling dead trees. No silvicultural practices have been employed since then, though work was continued on fire trail maintenance and firefighting water supply development, and the maintenance and improvement of some wildlife openings.

GEOLOGY

Historical Geology

Over the course of geologic history, approximately 4.6 billion years, four major mountain chains have stood in the vicinity of the Frederick City Watershed. Each of these mountain chains was subsequently eroded out of existence by millions of years of weathering.

More than one billion years ago, during the Precambrian Eon, North America collided with another tectonic plate to cause the Grenville Orogeny. An orogeny is a mountain-building episode, as the result of tectonic plate movement. When this orogeny was complete, millions of years of erosion wore the Grenville Mountains down, as the eastern side of North America became a passive plate margin and the once converging tectonic plates separated. This "stretching" of the crust between divergent plates caused massive faulting, which allowed lava to rise up from the earth's mantle and spread across the land. These lava flows would eventually become the Catoctin Metabasalt, which now underlies Catoctin and South Mountain.

By the end of the Precambrian Eon, and into the Cambrian Period, the constant erosion of the Grenville Mountains led to the deposition of large amounts of sediment. Streams and rivers flowed off the mountains and down onto the hardened lava flows. The water carried and deposited sediments that would be compacted into the sandstones, conglomerates, quartzites, and phyllites we see in the Frederick City Watershed today.

Three more orogenies occurred during the Paleozoic Era. The first was the Taconic Orogeny, which took place during the Ordovician Period (approx. 450 to 420 million years ago), and the second was the Acadian Orogeny, during the Devonian Period (approx. 360 mya). Both of these orogenies led to the formation of large mountain chains on the east coast of North America, but in both instances the rocks that are present today were underneath thousands of feet of rock layers which have since been eroded away. The result was that the present rock strata in the watershed were subjected to intense heat and pressure, causing them to be metamorphosed into their current textural and mineral composition.

The final orogeny was the Alleghenian Orogeny, which took place during the Permian Period (325 to 265 mya), and once completed, marked the end of the Paleozoic Era. During this orogeny, the rocks of the Blue Ridge Mountains were thrust and folded into their current shape and location. As part of this deformation, a large piece of crust, called a thrust sheet, was pushed from an area over 100 miles west of here to its present location. This thrusting caused large-scale buckling, bending, faulting, and folding of the rock strata. What resulted was the Blue Ridge Anticlinorium, a regional-sized arch of rock over 20,000 feet tall. Catoctin Mountain is what remains of one arm of the anticlinorium, and South Mountain is the other arm. Because of this, the rocks units that underlie the watershed dip, fairly gently, to the southeast.

Ever since the end of the Paleozoic Era, the East Coast of North America has been a passive plate margin, and an area of erosion. Millions of years of erosion reduced the

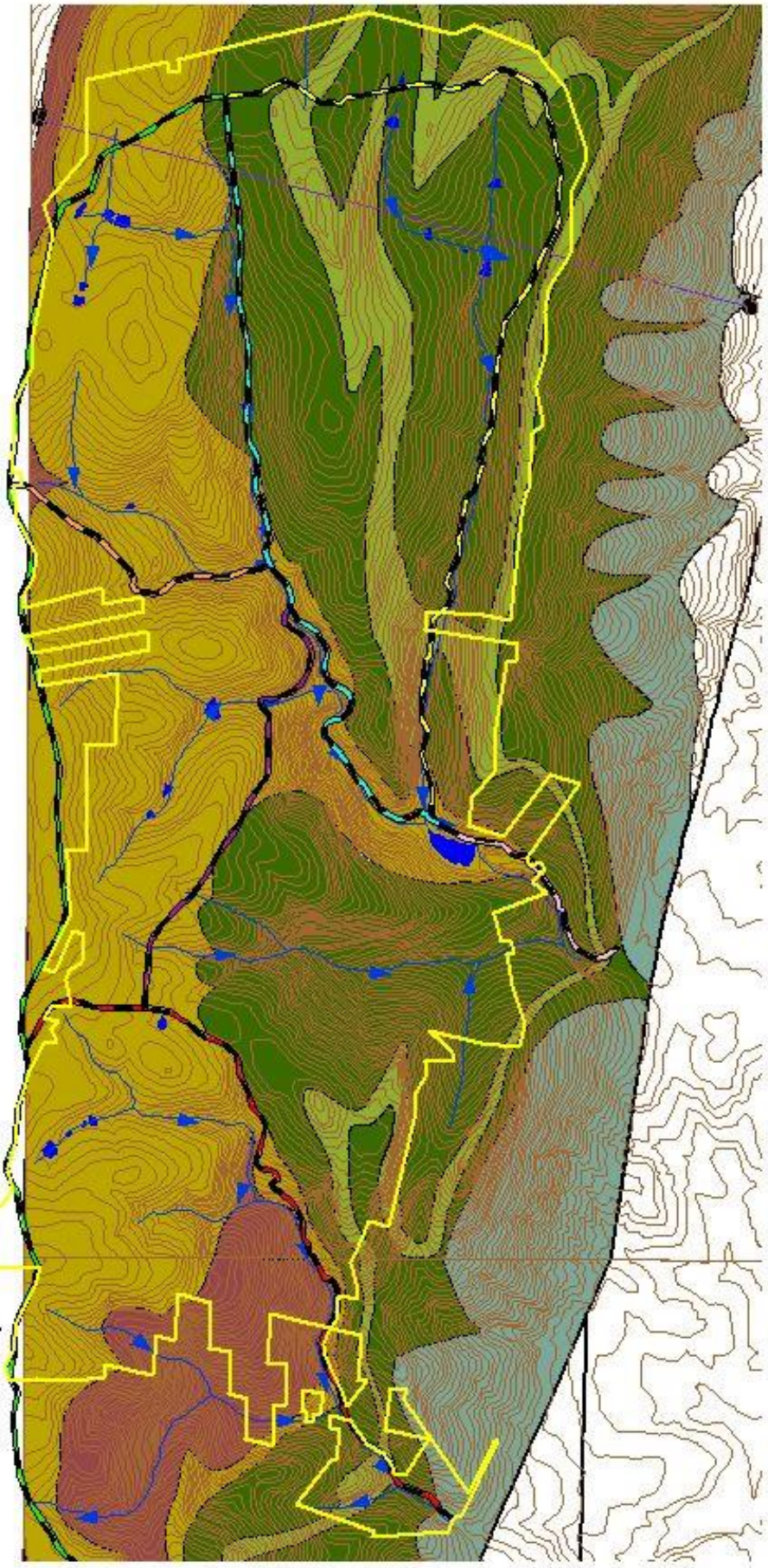
Frederick City Watershed Geology Map

LEGEND

- Boundary
- Left Hand Fork Road
- Gambrill Park Road
- Right Hand Fork Road
- Mountaindale Road
- Delauter Road
- Cold Deer Road
- Hamburg Road
- Streams
- Lakes/Ponds
- Topographic Contours
- Structural Geology Lines

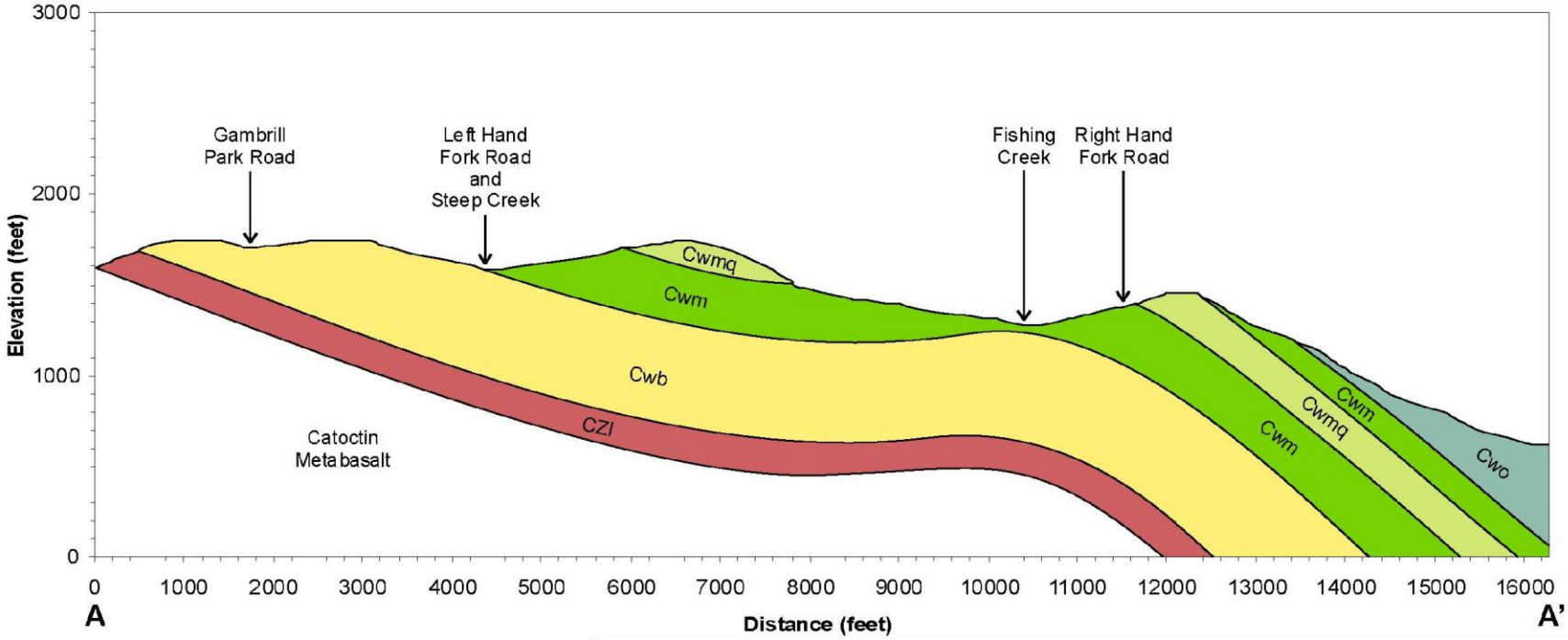
Geologic Units:

- Cwo - Weverton Formation, Owens Creek Member
- Cwmq - Weverton Formation, Maryland Heights Member, quart.
- Cwm - Weverton Formation, Maryland Heights Member
- Cwb - Weverton Formation, Buzzard Knob Member
- CZl - Loudoun Formation



1 Inch = 48000 inches = 4000 feet

Geologic Cross-section of the Frederick City Watershed from A to A'



Legend:

- = Weverton Formation - Owens Creek Member (Cwo)
- = Weverton Formation - Maryland Heights Member (Cwm)
- = Weverton Formation - Maryland Heights Member - Quartzite Layer (Cwmq)
- = Weverton Formation - Buzzard Knob Member (Cwb)
- = Loudoun Formation (CZl)

2x Vertical Exaggeration

mountains of the Alleghenian Orogeny to a nearly flat plain. Layers of rock that were miles in thickness were removed from the continental plate and deposited in the ocean. This was an unimaginable amount of weight removed from the tectonic plate, which is more-or-less floating on the fluid mantle of the earth. As with any floating object, the removal of that weight caused the tectonic plate to isostatically rebound, or in essence, "bob" up in elevation. This caused renewed erosion and down cutting.

All of the topography of the Blue Ridge Province is a result of erosion and the differential weathering of resistant and less resistant rock units, as well as preferential erosion along fracture and fault lines. Catoctin Mountain and South Mountain are small vestiges of the Blue Ridge Anticlinorium, formed by erosion and "held up" or capped by resistant strata. Likewise, our valleys and swales are formed where softer rocks allow for greater erosion.

Rock Formation Descriptions

The core of the Catoctin Mountains consists of a unit of rock called the Catoctin Metabasalt. This is a thick layer of rock composed of metamorphosed Precambrian volcanic rocks, which were originally in the form of basalt and rhyolite. These are the remnants of the extensive lava flows that followed the Grenville Orogeny. The Catoctin Metabasalt, however, does not crop out in the Frederick City Watershed. Instead, it lies deep beneath the surface, underneath a series of younger rock units.

Two primary rock formations form the bedrock of the Frederick City Watershed. The first, and oldest, formation is the Loudoun Formation. Since there are no recognizable fossils in the Loudoun Formation, the age of the unit remains somewhat of a mystery. Consensus among the experts, however, places this formation as being very early Cambrian in age. The Loudoun Formation is quite heterogeneous in composition and includes rock types ranging from gray or brown phyllites to light gray quartz-pebble conglomerates. These units are interbedded in various proportions, but the total thickness of the formation ranges up to 75 feet thick. By far, the most common lithology of the Loudoun Formation is dark-gray phyllite.

A phyllite is fairly highly metamorphosed shale. These rocks are strongly foliated, dark in color, and have a sheen due to the presence of muscovite mica. A closer look at the composition of the rock reveals a variety of grain-sizes and minerals. This is characteristic of a texturally and chemically immature rock, and therefore, a rock composed of sediments deposited relatively close to the source area. The Loudoun Formation represents river deposits of sediments from the Grenville Mountains. Likewise, the interbedded nature of the various compositions reflects localized changes in the lithology of the source rocks from which these sediments were weathered. Also, the thickness of the formation fluctuates greatly from location to location, reflecting the irregularity of the Catoctin Formation upon which it was deposited. The Loudoun Formation, as compared to other rock units in the Frederick City Watershed, is easier to break down, both physically and chemically. Therefore, the presence of the Loudoun Formation is often revealed topographically as a lowland or depression.

Clifford Hollow, at the south end of the watershed, and the gap in the mountain at Five Forks, are both underlain by the Loudoun Formation.

The second, and most prevalent rock unit in the Frederick City Watershed is the Weverton Formation. This unit is the major ridge-forming rock in the Blue Ridge Province, ranging up to 600 feet thick and composed primarily of folded quartzite, conglomerate, and metasiltstone. The presence of distinctive fossils at other localities of the Weverton Formation places it as being Cambrian in age. Due to the vast thickness of this formation and the varying lithologies present, the Weverton Formation has been divided into three sub-units, called “members”.

Of the Weverton Formation members, the oldest and most prominent is the Buzzard Knob Member. This member is the most resistant to weathering and therefore caps most of the ridge tops of Catoctin and South Mountains. It can range up to 160 feet thick and is composed primarily of light gray, medium bedded, medium to coarse-grained quartzite. A quartzite is a low-grade metamorphic rock, derived from a relatively clean quartz sandstone. Other lesser lithologies present in the Buzzard Knob Member include thin, highly sheared layers of dark gray phyllite, and coarser-grained quartzites and conglomerates.

Since a quartzite was originally composed of primarily quartz sand and quartz pebbles, it is much more chemically mature than a phyllite. A rock containing a large amount of clean quartz grains represents sediments deposited farther from the source area, usually in lowland rivers and nearshore delta environments. The presence of cross-bedding in the Buzzard Knob Member also indicates that it is a river deposit, since the cross-beds represent the meandering sandbars of a river. Quartz is very resistant to physical and chemical weathering, and therefore creates a very resistant rock. For this reason, the Buzzard Knob member of the Weverton Formation underlies all of the ridge tops along the western side of the Frederick City Watershed.

Above the Buzzard Knob Member is approximately 300 feet of medium to dark-gray phyllite, metasiltstone, and greywacke, which is called the Maryland Heights Member. Metasiltstone, as the name implies, is a metamorphosed siltstone, and greywacke is a type of sandstone that has a higher content of feldspar and clay. These rock layers share the textural and chemical immaturity of the Loudoun Formation, and therefore represent a similar depositional environment. Likewise, the Maryland Heights Member is not as resistant to weathering as the Buzzard Knob Member. For this reason, the Maryland Heights Member can be found underlying lowland areas and valleys within the watershed, such as the valleys along Left Hand Fork Road, Right Hand Fork Road, and Oxys Hollow.

Within the Maryland Heights Member, there is a 70-foot thick layer of quartzite that is nearly identical to the quartzite of the Buzzard Knob Member. This is important because it means there is a small, potentially ridge-forming rock layer in the middle of the otherwise less resistant Maryland Heights Member. Logic dictates that this layer should be topographically prominent; and it is. The ridge tops and rock outcrops on

both sides of Right Hand Fork Road, and the east side of Hamburg road, are composed of this rock unit.

The final, youngest member of the Weverton Formation is the Owens Creek Member. This unit is similar in composition to the Buzzard Knob Member, but does not form as many prominent ridges, and is also not as significant in the Frederick City Watershed. The Owens Creek Member consists of 140 feet of medium-bedded coarse-grained quartzite and conglomerate, along with some thinner beds of greywacke and siltstone. Along South Mountain and the northern areas of Catoctin Mountain, the Owens Creek Member plays a more prominent role as a ridge-forming unit. Just to the east of the Frederick City Watershed, the Owens Creek Member creates the steep eastern slopes of Catoctin Mountain as it descends into Frederick Valley.

Rocks and Soils

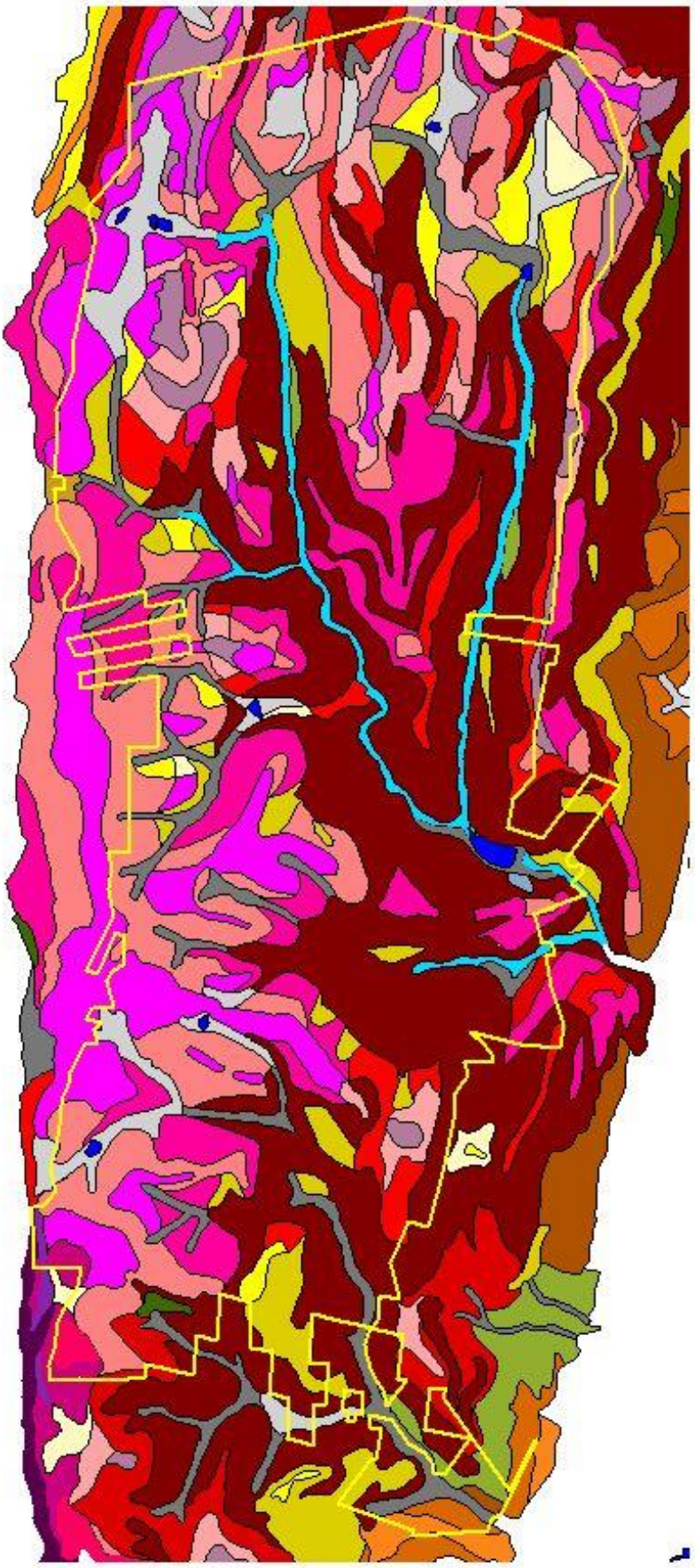
The mineralogical component of soils is derived from the physical and chemical weathering of bedrock. In Frederick County, most of our soils are kept relatively in place, above the parent rock from which they are derived. Therefore, the textural and chemical nature of the soils in the Frederick City Watershed is largely a function of the underlying bedrock.

Soils that are derived from quartzites and conglomerates, such as the Buzzard Knob and Owens Creek Members of the Weverton Formation, will tend to be very sandy in nature. These rocks are composed almost entirely of quartz sand grains and pebbles, cemented together and later melted together. When broken down over time, these rocks will therefore yield almost nothing but quartz sand. Quartzites and conglomerates are also river deposits, which contain virtually no calcium carbonate (such as limestone). The resulting soils will therefore tend to be very acidic and have very little buffering capacity.

Phyllite rocks, such as in the Loudoun Formation and the Maryland Heights Member of the Weverton Formation, are derived from shale. Shale is composed largely of compacted clay grains. Therefore, when phyllites are weathered, the resulting soil is likely to have a higher clay content. Most of the phyllites in the Frederick City Watershed, however, also have a fairly high quartz content, which will add a sand component to the soil. Soils derived from phyllites will therefore take the form of a loam or sandy-loam type. As with the quartzites, phyllites are also river deposits, lacking in calcium carbonate. So, the soils they produce will also be acidic and unable to buffer acidity.

David Robbins, Md. DNR Forest Service, provided the geology information provided above.

SOILS



LEGEND

City Watershed Boundary

Soils

- ArB
- ArD
- BaB
- BaC
- BaD
- BbD
- BbE
- EgB
- EgC
- EgD
- ErB
- ErC
- ErD
- ErE
- FoB
- MnA
- StB
- StC
- StD
- SuD
- SuF
- UdC
- W
- WeC
- WeD
- WeE

N

FREDERICK CITY WATERSHED

SOILS

The soils found on the Watershed are primarily derived from quartzite, phyllite, greenstone, muscovite schist, and siltstone. They vary from poor to excellent in potential productivity for trees, with most sites being fair or average. They are strongly to moderately acidic, which limits the tree species that can grow here. Since calcium carbonate and magnesium carbonate are virtually absent, these soils have little buffering capacity, making the soils, vegetation and streams susceptible to acid precipitation.

Soil Types

Airmont Series

The Airmont series consists of very deep, moderately well drained soils. Permeability is moderately rapid above the fragipan and slow in the quartzite, phyllite, and siltstone. They are on strongly sloping and moderately concave mountain backslopes and footslopes. The pH ranges from 4.5 to 5.5. Slopes range from 3 to 25 percent.
ArB – Airmont cobbly loam, 2 to 8 percent slopes, extremely stony.
SI – NRO 70, Cu ft/ Acre/Yr – 57
ArD – Airmont cobbly loam, 8 to 25 percent slopes, extremely stony.
SI – NRO 60, Cu ft/ Acre/Yr – 43

Bagtown Series

The Bagtown series consist of very deep well drained soils. Permeability is moderately slow or slow. These soils formed in colluvial materials on mountain backslopes, footslopes, colluvial fans, and benches. The pH ranges from 4.5 to 5.5. Slopes range from 3 to 45 percent.
BaB – Bagtown cobbly loam, 3 to 8 percent slopes, extremely stony.
SI – NRO 69, Cu ft/ Acre/Yr – 57
BaC– Bagtown cobbly loam, 8 to 15 percent slopes, extremely stony.
SI – NRO 69, Cu ft/ Acre/Yr – 57
BaD– Bagtown cobbly loam, 15 to 25 percent slopes, extremely stony.
SI – WO 69, Cu ft/ Acre/Yr – 57
BbD– Bagtown cobbly loam, 15 to 25 percent slopes, extremely stony.
SI – NRO 69, Cu ft/ Acre/Yr – 57
BbE– Bagtown cobbly loam, 25 to 45 percent slopes, extremely stony
SI – NRO 69, Cu ft/ Acre/Yr – 57

Edgemont Series

The Edgemont series consists of very deep, well-drained soils. Permeability is moderate. These soils formed from quartzite residuum. They are on nearly level to steep ridges and upper backslopes in the Piedmont and Blue Ridge provinces. The pH ranges from 3.6 to 5.5. Slopes range from 0 to 45 percent.
EgB– Edgemont gravelly loam, 3 to 8 percent slopes, very stony.
SI – NRO 69, Cu ft/ Acre/Yr – 57
EgC– Edgemont gravelly loam, 8 to 15 percent slopes, very stony.
SI – NRO 69, Cu ft/ Acre/Yr – 57

EgD– Edgemont gravelly loam, 15 to 25 percent slopes, very stony.
SI – NRO 69, Cu ft/ Acre/Yr – 57
ErC - Edgemont-Rock outcrop complex, 8 to 15 percent slopes
SI – NRO 69, Cu ft/ Acre/Yr – 57
ErE - Edgemont-Rock outcrop complex, 25 to 45 percent slopes
SI – NRO 69, Cu ft/ Acre/Yr – 57

Foxville Series
The Foxville series consists of very deep, somewhat poorly drained soils. Permeability is moderately slow. These soils formed in alluvium and colluvium derived from mixed greenstone, greenstone and gently sloping, high gradient flood plains. The pH ranges from 3.5 to 4.5 at the surface, and 4.5 to 6.0 in the subsoil. Slopes range from 0 to 8 percent.
FoB – Foxville cobbly silt loam, 0 to 8 percent slopes, rubbly.
SI – PO 90, Cu ft/ Acre/Yr – 72

Mt. Zion Series
The Mt. Zion series consists of very deep, moderately well drained soils. Permeability is moderately slow. These soils formed in residuum or soil creep from greenstone rocks they are on nearly level to strongly sloping mountain backslopes and footslopes. The pH ranges from 5.1 to 6.0. Slopes range from 0 to 3 percent.
MnA – Mt. Zion-Rohrersville complex, 0 to 3 percent slopes.
SI – NRO 73, Cu ft/ Acre/Yr – 57

Stumptown Series
The Stumptown series consists of moderately deep, well-drained soils. Permeability is moderately rapid. These soils formed partly in slope creep and partly in residuum that weathered from interbedded quartzite, quartz muscovite schist, and phyllite. They are on ridges and side slopes of Blue Ridge anticlinorium. The pH ranges from 4.5 to 5.5. Slopes range from 0 to 65 percent.
StB – Stumptown-Rock outcrop complex, 0 to 8 percent slopes.
SI – BO 80, Cu ft/ Acre/Yr – 72
StC – Stumptown-Rock outcrop complex, 8 to 15 percent slopes.
SI – BO 80, Cu ft/ Acre/Yr – 72
StD – Stumptown-Rock outcrop complex, 15 to 25 percent slopes.
SI – BO 80, Cu ft/ Acre/Yr – 72
SuD – Stumptown-Bagtown-Rock outcrop complex, 15 to 25 percent slopes.
SI – BO 80, Cu ft/ Acre/Yr – 72
SuF – Stumptown-Bagtown-Rock outcrop complex, 25 to 65 percent slopes.
SI – BO 80, Cu ft/ Acre/Yr – 72

Weverton Series
The Weverton series consists of deep, well-drained soils. Permeability is moderate. These soils formed in colluvium derived form interbedded quartzite and quartz over residuum weathered from muscovite schist and phyllite. They are often found on gently

sloping to steep, convex mountain backslopes along South Mountain and Elk Ridge. The pH ranges from 4.5 to 5.5. Slopes range from 8 to 45 percent.
WeC – Weverton-Hazel complex, 8 to 15 percent slopes, very stony
SI – NRO 70, Cu ft/ Acre/Yr – 57
WeD – Everton-Hazel complex, 15 to 25 percent slopes, very stony
SI – NRO 70, Cu ft/ Acre/Yr – 57
WeE – Weverton-Hazel complex, 25 to 45 percent slopes, very stony
SI – NRO 70, Cu ft/ Acre/Yr – 57

Site Growth Potential for Soil Types
Provided are the approximate Upland Oak Site Index (height of dominant trees at age 50) and potential cubic feet growth based on mapped soil types. These estimates of site quality frequently vary from field measurements, so field measurements were given precedence in determining site growth potential for individual stands.

Soil Types	Site Quality	Site Index	Potential Cubic Ft. Growth
StB, StC, StC SuD, SuF, FoB	Excellent	80+	70 cu. ft./acre/yr
ArB WeC, WeD, WeE MnA	Good	70-79	60 cu. ft./acre/yr
ArD BaB, BaC, BaD BbD, BbE EgC, EgB, EgD ErC, ErE	Average	60-69	50 cu. ft./acre/yr
None	Fair	50-59	40 cu. ft./acre/yr
None	Poor	< 50	30 cu. ft./acre/yr

WATER QUALITY

Objective - To maintain and improve the watershed as a source of high quality water

- Serve as a supply, current and future, of potable water for the City and surrounding areas.
- Provide high quality water and aquatic habitat conditions for living resources within the Frederick City Watershed.
- Contribute clean water for downstream uses and benefits, including the Monocacy River, Potomac River and the Chesapeake Bay.

The quality of the water coming from all waterways in the watershed is generally excellent. The streams on the property are excellent habitat for a variety of aquatic organisms, including trout. These headwater streams form the beginning of the aquatic food chain that continues downstream, with the largest problem being acidity limiting populations of aquatic organisms. There are approximately 26 miles of perennial streams and 14 ponds on the property, in addition to the reservoir. The Fishing Creek Reservoir provides 15-20% of the water needs for the City system. Water was once collected and piped into the City system from the "Tuscarora Receiver" on the Clifford Branch of Tuscarora Creek and from Oxys Hollow, though neither of these is currently "on-line". It is worth noting that all water draining from the property, even that which does not flow into the reservoir, is a part of the water supply for the City and surrounding areas, since all tributaries on the property flow into the Monocacy above the intake currently used as part of the City water supply system. The property also serves as a groundwater recharge area that provides water to numerous wells in the general area.

Water quality is the primary objective for the property. All other objectives are subordinate to water quality. Fortunately, the other objectives for the property are compatible with providing high quality water as long as certain practices are applied. The main factors that can degrade water quality in the Watershed – where point-source pollution is yet not much of a consideration - are sediment, nutrients, temperature, and acidity. The most likely agents of potential degradation are roads and trails that can erode and deposit sediment in the waterways and the nutrients (mostly phosphorus) that are tied to sediment; removal of trees over and along waterways that can increase solar radiation to the water, and acid precipitation interacting with the acidic soils found here. Roads and trails, whether they are for recreation, timber harvesting, or emergency access, are the principal concern. Timber harvesting in itself does not cause erosion and sediment pollution except that which can result from the roads, trails, and loading areas used to remove the timber. As long as good practices, known as best management practices (BMPs) are used in connection with the roads and trails, and the stream banks are not directly impacted, logging does not create accelerated sediment inputs into streams. The biggest impacts on water quality currently are the public roads, roads into private in-holdings (Stoner Road, Oxys Hollow) and the more

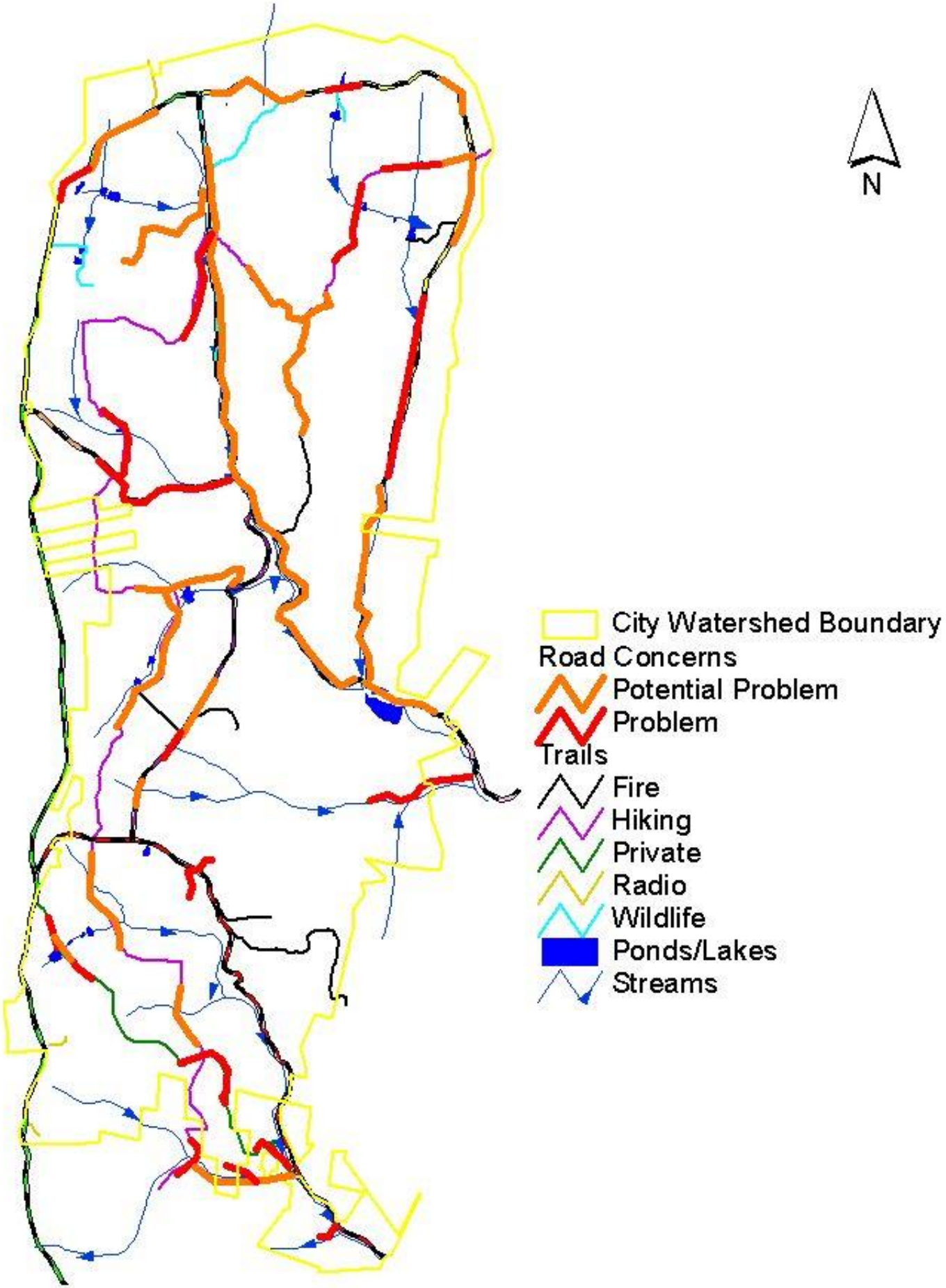
heavily used recreational trails (Catoctin Trail). The unauthorized use of ATV's and dirt bikes within the watershed poses a serious problem, as these often cross streams and climb steep slopes. As more single-home development is taking place on the fringes of the property, private driveways and septic systems are probably contributing a greater amount to sediment and nutrient problems.

Detailed information about the water quality attributes of the property is included in the NED reports for each compartment.

Roads and Trails

There are 25.8 miles of public roads owned and maintained by the County that adjoin or traverse the property. The public roads on the Watershed have names that vary depending on the section of the road described, and the map, deed, or other source of reference used. For purposes of this plan, starting from the north, the roads are named Gambrill Park Road (9 miles, also known in sections as Old Frederick Road and Ridge Road), Right Hand Fork Road (4.9 miles, also known in sections as Gambrill Park Road, Old Frederick Road and Little Fishing Creek Road), Left Hand Fork Road (4.9 miles, also known as Step Creek Road, Steep Creek Road, Fishing Creek Road and Big Fishing Creek Road), Cold Deer Road (2.1 miles, also known as Fishing Creek Road), Mountaindale Road (1 mile), and Hamburg Road (3.6 miles). These roads are shown on the maps included with this plan. Most of these roads are unpaved gravel roads, the exceptions being Hamburg Road, most of Gambrill Park Road, and short sections of Cold Deer Road and Mountaindale Road. There are around 100 miles of other roads and trails on the property, in a variety of conditions and degrees of use, from well defined and legally deeded roads, to "renegade trails" created by 4-wheel vehicle and ATV users or mountain bikers, to overgrown and virtually un-used former logging roads and hiking trails. Many roads and trails were originally created during the 1800's during the period of charcoal production, and some of these are still in use today. The Civilian Conservation Corps created or improved many miles of roads and trails on the Watershed. Roads and trails are the most significant sources of current and potential sediment pollution. The areas identified as currently most problematic are identified on the attached map, and include the ford on Delauter Road, sections of Left-Hand Fork Road, several areas on Stoner Road and Oxys Hollow being used by private in-holding landowners, and sections of the Catoctin Trail. Inadequate, improper, or poorly maintained culverts and drainage ditches are a problem on the public roads. Any roads or trails that cross streams are of special concern since these are the intersection of the source of sediment and the resource that needs protection. The ford on Delauter Road offers the potential for petroleum products and soil washing off vehicles as they cross, and people sometimes wash cars in this ford. ATVs crossing streams in numerous places are a problem not only from transport of sediment but also the destabilization of streambanks and disturbance of the stream bottom. Many of the old roads and trails dating from the 1800's ran straight up and down the mountain, a poor situation that leads to erosion gradually cutting down into the surface so that the roadway becomes a huge gully with high side banks, making it impossible to divert water off away from the road.

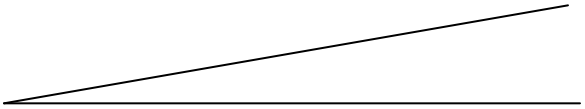
ROAD AND TRAIL CONCERNS



Slope Steepness Zones

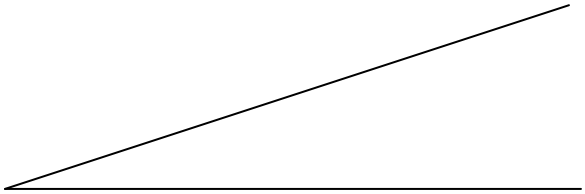
While activities such as timber harvesting or use of recreational trails can take place on steeply sloping land without negative effects on water quality, extra care is required and the risk of problems is increased. For this reason activities on steep slopes should be limited. Areas indicated on attached the map are generalized, and include small areas of greater or lesser steepness. Field evaluation and demarcation of areas with slope limitations should be conducted prior to any activities. Note that the slopes referenced below are for the slope of the land on which timber harvest or other activities would take place, not the slope of roads and trails, which should be on the contour or angled across the hillside.

a. 0-20% slope, gently sloping. No limitations. Standard erosion and sediment control practices are used.



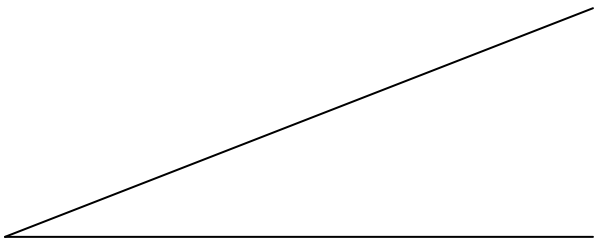
20% slope
(11 degrees)

b. 20-40% slope, moderately steep. Some limitations on vehicle and equipment use, timber harvesting, roads and trails are appropriate. Additional care needed in erosion and sediment control.



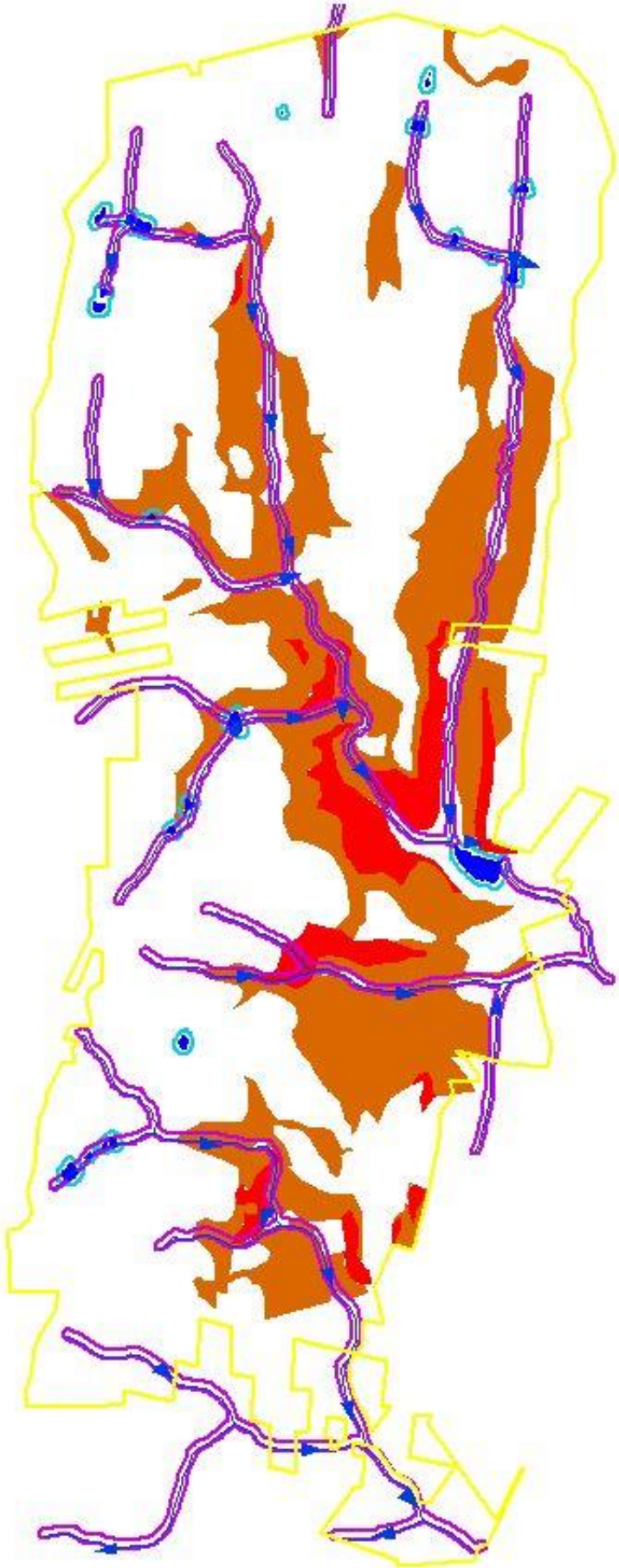
30% slope
(17 degrees)

c. Greater than 40% slope, steeply sloping. Significant limitations on vehicle and equipment use, timber harvesting, roads and trails are appropriate. Typically, no harvesting would take place except where needed to address critical forest health issues. Special care needed in erosion and sediment control.



40% slope
(22 degrees)

WATER QUALITY CONCERNS



LEGEND

- City Watershed Boundary
- Streams
- Ponds/Lakes
- 100 Foot Buffer of Streams
- 100 Foot Buffer of Lakes/Ponds
- 40 Percent Slope
- 20 Percent Slope

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FREDERICK CITY WATERSHED

Streamside Management Zones

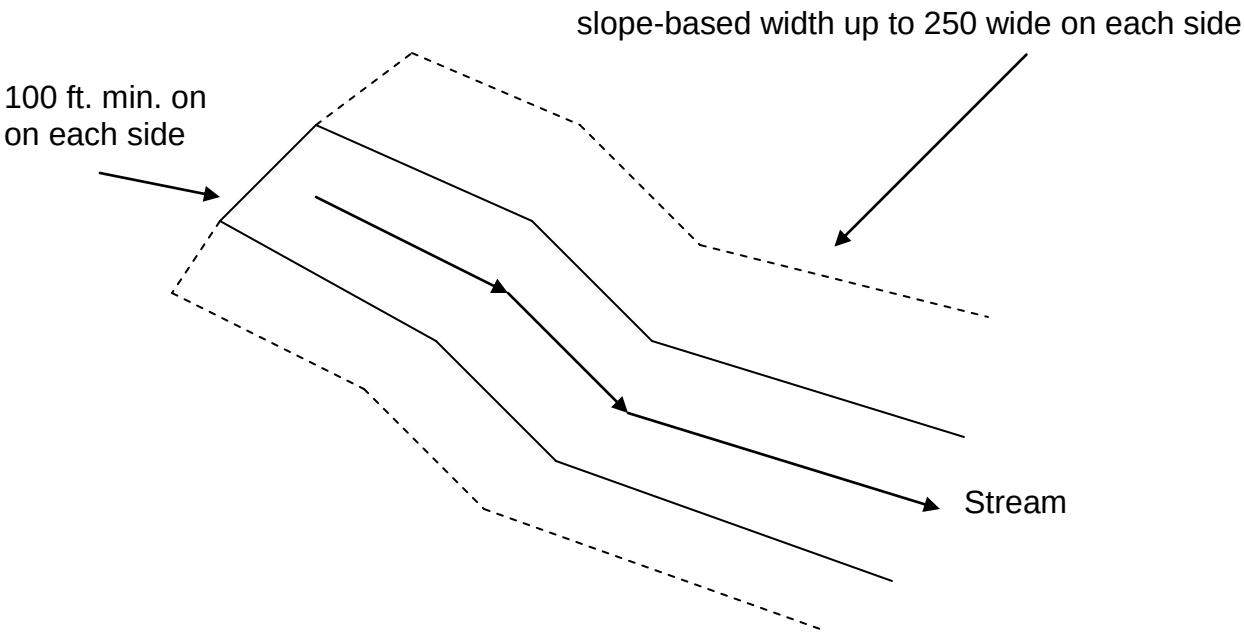
Streamside management zones (SMZ), also known as stream buffers or riparian forest buffers, are one of the most important mechanisms for protection of water quality and water-dependent living resources. There should be significant limitations on vehicle and equipment use, timber harvesting, roads and trails within the SMZ. State regulations apply to timber harvesting and road construction in streamside management zones. Areas indicated on map indicate the Frederick City Watershed minimum buffer width of 100 ft., which is stricter than State requirements. Field evaluation and demarcation of appropriate buffer width should be conducted prior to any activities. All standards and specifications promulgated by Maryland Dept. of Environment (MDE) for timber harvests should apply, with the addition of the stricter minimum width requirement described below.

Maryland guidelines for timber harvesting and related activities within an SMZ currently being developed by Maryland Dept. of Environment require that an SMZ of between 50 feet and 150 feet in width be retained between any watercourse and a harvested area, road or skid trail. The formula used is: width = 50 ft. + 2 ft. for every 1% of slope. This formula was based on research by Trimble and Sartz (1957). Years of field experience and evaluation (Haussman and Pruett 1978, Hartung and Kress 1977, Pannill et al. 2000) in a wide range of conditions and geographical areas have confirmed the validity of slope-based SMZ widths as an effective means of protecting water quality.

As an extra precaution within the Frederick City Watershed, the formula used for determining the width of buffers should be 50 ft. + 4 ft. (instead of the draft standard 2 ft.) for every 1% slope, but the minimum width should be 100 feet. Within the first 100 feet of SMZ nearest the water, no harvesting should take place, except what is required for access to approved stream crossings or to protect forest health or public safety. Any harvesting in the area outside the first 100 feet should be done under a custom plan prepared by a professional forester and approved by MDE, and will retain at least 60 square feet of basal area in forest trees.

Av. % Slope	Min. SMZ per MDE*	Minimum SMZ Width Recommended in Frederick City Watershed
0%	50 feet	100 feet
10%	70 feet	100 feet
20%	90 feet	130 feet
30%	110 feet	170 feet
40%	130 feet	250 feet
50%	150 feet	250 feet

* Draft Erosion and Sediment Control Standards and Spec's for Timber Harvest Operations, MDE, Sept. 2004



Example of Streamside Management Zone (SMZ)

It should be noted that most of the public roads found on the Watershed (including Mountaindale Road, Left Hand Fork Road, Right Hand Fork Road, Delauter Road, Hamburg Road, Cold Deer Road) have a significant portion of their length within an SMZ. There are also a number of minor roads and trails within SMZs, many of which are stable and usable ones that in most cases can and should be used rather than go to the expense and disturbance of constructing new ones. New construction of roads within the SMZ should be avoided or very limited.

Wetlands

Wetlands contribute to water quality by slowing and filtering water, removing excess nutrients and moderating pH. Wetlands are also habitat for a number of specialized plants and animals, including some that are rare or threatened. While the mountainous terrain of most of the Watershed means that there are relatively few wetlands, which are typically located in riparian areas near the streams and ponds, those that do exist are all the more important for their scarcity.

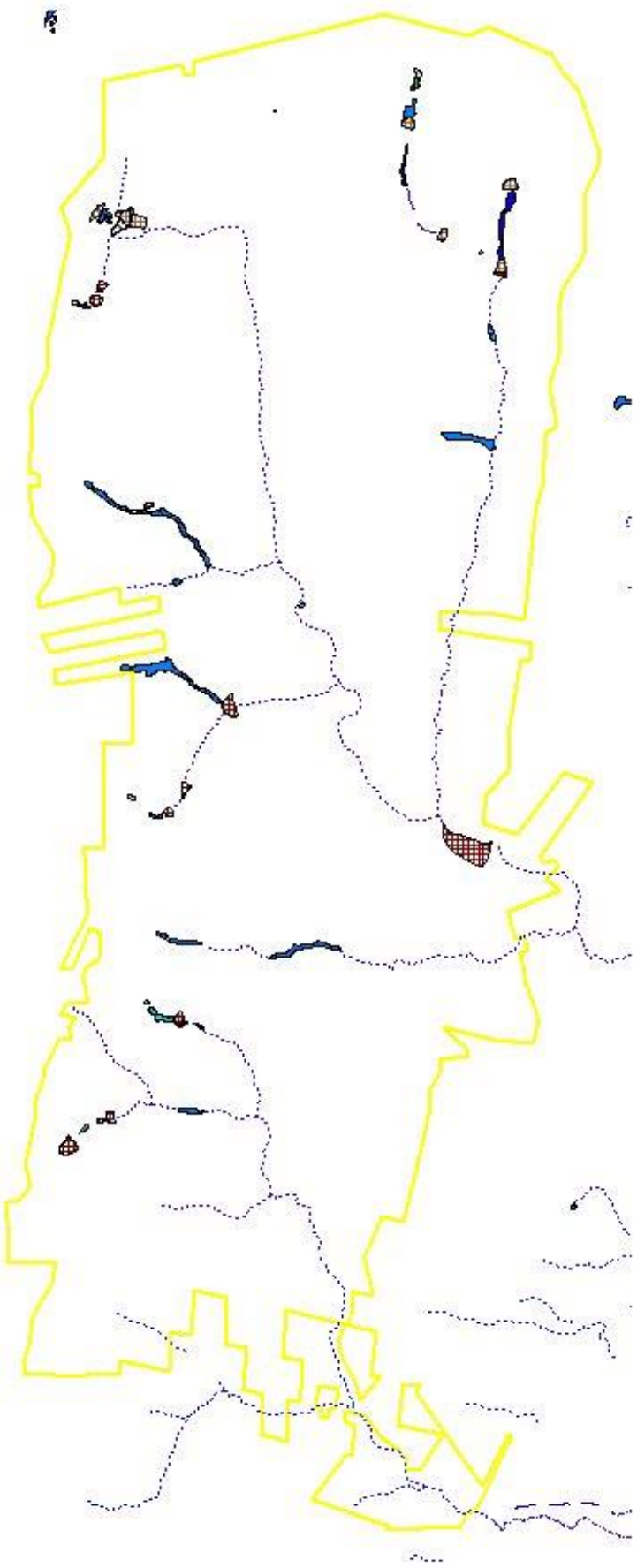
Wetlands, and certain wetlands designated “Wetlands of Special State Concern” that are deemed to be particularly important due to unique qualities or the presence of rare or threatened species, are indicated on the attached map. There are other small wetlands, typically spring seeps, which are likely not mapped. Wetlands are generally included in areas already designated as streamside management zones. Wetlands should receive the same protection as the 100 foot near-stream portion of the Streamside management zone, even if they may be outside the SMZ.

Wetland Classification Codes

The following codes are used to describe wetland areas on the Wetlands map for Frederick City Watershed:

R2UBH	Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
R3UBH	Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded
R5UBH	Riverine, Unknown Perennial, Unconsolidated Bottom, Permanently Flooded
R3RBH	Riverine, Upper Perennial, Rock, Permanently Flooded
PEM1A	Palustrine, Emergent, Persistent, Temporarily Flooded
PEM1E	Palustrine, Emergent, Persistent, Seasonally Flooded Saturated
PEM1Eh	Palustrine, Emergent, Persistent, Seasonally Flooded Saturated, Diked/Impounded
PFO1A	Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded
PFO1B	Palustrine, Forested, Broad-leaved Deciduous, Saturated
PFO1C	Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded
PFO/SS1E	Palustrine, Forested/Scrub-Shrub, Broad-leaved Deciduous, Seasonally Flooded Saturated
PUBHh	Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded
PUBHx	Palustrine, Unconsolidated Bottom, Permanently Flooded, Excavated

WETLANDS



LEGEND

Frede4l6.shp
- R2UBH
- R3UBH
- R5UBH

Catoc4l6.shp
- R3RBH
- R3UBH
- R5UBH

Catoc3l6.shp
- R2UBH
- R3UBH
- R5UBH
- Boundary

Catoc3p6.shp
- PEM1E
- PEM1Eh
- PFO1A
- PFO1B
- PFO1C
- PUBHh
- PUBHx

Catoc4p6.shp
- PEM1A
- PEM1E
- PFO/SS1E
- PFO1A
- PFO1B
- PFO1C
- PUBHh
- PUBHx
- Outholdings

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FREDERICK CITY WATERSHED

Forest Fires

Large, intensely burning forest fires, especially on steep slopes and near streams, can harm water quality by consuming groundcover, leaf litter, and duff. Exposed mineral soil and ash can then be washed downhill into waterways. However, it should be understood that not all forest fires are harmful to water quality or other resources. Small, low-intensity forest fires burning in areas not adjacent to waterways pose little risk to water quality, can improve certain forest and wildlife habitat conditions, and can prevent the occurrence of more serious wildfires. The issues of forest fire prevention, preparedness and suppression will be addressed in a separate Wildfire Mitigation Plan currently being prepared by the Maryland DNR Forest Service.

The recommendations for production of water quality on the property are:

- Review with Frederick County the existing public roads, especially in terms of culverts, drainage ditches, surfacing.
- Try to limit heavy recreational use (particularly by horses and mountain bikes) of roads and trails to a few that are well located and stabilized.
- Enforce prohibition of motorized vehicles (4-wheelers, dirt-bikes, ATVs).
- Relocate or close existing problematic roads and recreational trails that are un-needed or poorly located.
- Make sure that all timber harvesting activities, including those for roads, trails and loading areas meet or exceed Maryland requirements and BMP guidelines.
- Limit activities on steep slopes.
- Limit activities in streamside management zones.
- Limit activities in wetlands.
- Take measures to prevent large, high intensity forest fires as per future Wildfire Response Plan.
- Protect ponds and dams from failure and release of bank-eroding flows and built up sediment by cutting trees and treating stumps on dams and improving outlet and overflow structures.
- Plan for construction of a bridge on Delauter Road to replace the existing ford.
- Investigate the feasibility, desirability and cost of lime-dosing or similar measures to reduce pH of otherwise high-quality streams within the Watershed.

FOREST HEALTH

Objective - To continue protection of the watershed from the detrimental elements of wildfire, insects, disease, and erosion.

- Monitor populations and conditions that promote damage from wildfire, insects, diseases, and invasive exotic plants and take measures to prevent damage when appropriate.
- Create a diversity of tree species, sizes and age classes to minimize catastrophic loss from insect or disease outbreaks.

While there are a number of native insects (fall cankerworms, walkingsticks) and diseases present on the Watershed, in general these do not present a severe problem. Alien insects, diseases, and invasive plants have previously presented problems and will continue to do so. Especially with the current high level of overseas trade, other pests will undoubtedly arrive to threaten the forest. This points out the value in keeping one species or genus of tree to a limited proportion of the forest composition, and to keep the trees growing in a vigorous manner so that they can better withstand both primary and secondary pathogens.

Insect Pests

The insect pest that has had the greatest impact on the Watershed is the gypsy moth (*Lymantria dispar)*, which is an introduced pest that feeds on leaves, especially oak leaves, during its caterpillar stage. This pest appeared here with unexpected severity in the early to mid 1980's (peak year for defoliation was 1984) and caused the mortality of a great many oak trees on the property – when combined with drought conditions and secondary pathogens such as shoestring root rot disease and the two-lined chestnut borer. Since the forest was made up mostly of oak, it was particularly susceptible. In recent years the population of gypsy moth has been very low due to several diseases that have developed in the gypsy moth population. However, the effectiveness of these diseases is influenced by spring weather conditions, and the gypsy moth population is expected to be a recurring problem. Keeping the oak component below 50%, and keeping stand basal area densities lower than 80% are valuable risk reduction strategies (Kurt Gottschalk, USDA-FS, 1993). There may come a time when it would be essential to spray part of the Watershed on short notice to control gypsy moth, and City funds may be needed. Another alien insect pest that has been a problem is the hemlock wooly adelgid *(Adelges tsugae)*, which arrive in the Watershed about 1990. This small insect, which is similar to aphids and scales, sucks the sap out of hemlock needles, reducing the vigor of the tree, which then often goes into a fatal decline. Maryland Dept. of Agriculture, Forest Pest Program, is currently monitoring and treating adelgid population on the Watershed, primarily in the area along Fishing Creek just above the reservoir. They are using a systemic insecticide injected into some of the hemlocks, and are releasing small beetles *(Sasajiscymnus tsugae)* and *(Laricobius nigrinus)*, that prey upon the adelgid. It is too soon to determine the success of these efforts. Another introduced insect that is becoming a problem for hemlock in Maryland, and in the Watershed, is elongate hemlock scale

(Fiorinia externa). This scale insect often occurs along with the hemlock wooly adelgid. Two other alien insect pests that have arrived in the U.S., and may eventually become a problem on the Watershed, are the emerald ash borer *(Agrilus planipennis)*, and the Asian longhorn beetle *(Anoplophora glabripennis)*. The emerald ash borer, which is now in Michigan and Ohio, will almost certainly arrive here eventually, and is devastating to all ash trees, which are present but not common on the watershed. The Asian longhorn beetle is now in New York City and Chicago, and may be held in check, but would be devastating to the large numbers of red maple found on the Watershed.

Information on insects and diseases above was provided in part by Robert Rabaglia, Md. Dept. of Agriculture, Forest Pest Management.

Diseases

Most of the diseases that pose a problem for plants in the watershed are fungus diseases. The disease that has had the greatest impact on the Watershed is the chestnut blight, (*Cryphonectria parasitica)*, which arrived here in 1918, and nearly wiped out the American chestnut on the Watershed. This disease is still present in the forest, surviving on other species, so blight-resistant strains of the chestnut will have to be developed to restore chestnut to the forest. Further information is provided in a later section on chestnut and the chestnut blight. Another probably imported disease that has impacted the flora on the watershed in dogwood anthracnose *(Discula destructiva)*, nearly wiped out the dogwood in the forest understory in the Watershed in the 1980's. Another imported disease which may be on the horizon is "Sudden Oak Death" or phytophthora canker disease *(Phytophthora ramorum)*. This disease, which is now on the West Coast but can be spread in the nursery trade, affects a number of species found on the Watershed, including oaks, blueberries and mountain laurel. It is unknown if it can be a propagate in the weather conditions of the eastern U.S., but it is potentially quite a serious problem.

Invasive Alien Plant Species

One of the most serious threats to the forest is invasive alien plant species. While not as obvious and dramatic as some insect and disease outbreaks, it is increasingly recognized that the gradual insidious infestation of the forest by exotic plants can be just as damaging in the long term. Alien plants displace native plants with greater economic or ecological value, and this can have consequences, sometimes not easily recognized, on the life cycle of certain insect and bird species, and on soil chemistry and nutrient cycling in the Watershed. The population of invasive plant pests is heaviest on the edges of the roads and other permanent openings. While hand-pulling or cutting is possible for some of the annual species, if anyone could be found to do it on the scale needed, as a practical matter the only effective control method is the judicious use of EPA approved herbicides under the direction of certified applicators. Some of the more serious invasive alien plant species found on the Watershed are:

Common Name	Scientific Name	Type of Plant
Japanese Stiltgrass	*Microstegium vimineum*	annual grass
Mile-a-Minute	*Polygonum perfoliatum*	prickly annual vine

Multiflora Rose	*Rosa multiflora*	thorny shrub
Japanese Barberry	*Berberis thunbergii*	thorny shrub
Tree-of-Heaven	*Ailanthus altissima*	tree

Other plant pests are present in low numbers, or are potential pests that have not yet appeared. More information on these species is included in the Appendix. Aside from the "normal" methods of introduction and spread by birds and wind, two noteworthy, mechanisms of introduction are in play in the Watershed. Japanese stiltgrass has spread along virtually every road and trail, the fine seeds probably being spread on the tires of mountain bikes, vehicle and ATV tires, hiking boots and deer hooves. Another situation is created by the dumping of yard waste in the Watershed, which has introduced English Ivy, Common Daylily and other plant pests into the forest.

Abiotic Diseases

The principal abiotic (non-biological) pathogen at work in the Watershed is air pollution. Our general area is in a part of the U.S. that has a fairly high level of acid deposition (both wet "acid rain", and dry deposition), as well as nutrient deposition (nitrogen and sulfur) due to air pollution. Catoctin Mountain, being at a higher elevation and receiving a slightly higher rainfall than most of surrounding area, has a greater amount of acid precipitation and excess nutrient pollution. Since the rock formations and resulting soils found on the Watershed are acidic and have no significant buffering capacity, they enhance the risk. There is probably already an impact on the soils and vegetation, as there is on the streams, though to what extent is not known. Instances of forest decline, especially in conifer species (which have foliage exposed year-round and are not tolerant of high nitrogen levels), have been documented further to the north and to the south. This is a situation that bears watching and investigating, though there is probably nothing that can be done at the local level to prevent or address such a problem.

Detailed information about the forest health attributes of the property is included in the NED reports for each compartment.

The recommendations for protection of forest health on the property are:

- Work with Maryland Dept. of Agriculture to monitor populations of gypsy moth, hemlock wooly adelgid, elongate hemlock scale, and other current or potential pathogens.
- Budget and/or reserve funds for treatment of threats to forest health, some of which may arise suddenly and unexpectedly.
- Carry out a program over the next few years to eliminate alien plants on roadsides and on the edge of permanent openings. These areas are the most easily accessible for control activities and are the areas most commonly infested. This will prevent these areas from being an ongoing source for the spread to other areas of the property. The Frederick County Weed Control Program could do this work on a time plus materials basis. Periodic re-treatment of these areas may be needed.

- Try to limit recreational hiking and mountain biking to certain established trails, which can be periodically checked for invasive plants and treated as necessary.
- Monitoring for invasive alien plants and keep records of locations, species, and any treatment applied.
- Prior to any type of timber harvest activity eliminate invasive alien plants to the greatest extent practical. This will allow work to take place while it is relatively easy to work in the stand, and will reduce the seed source for potential spread following increase in sunlight.

WILDLIFE HABITAT

Objective - To provide high quality fish and wildlife habitat on a continuing basis.

- Provide quality habitat for a variety of game and non-game species of fish and wildlife.
- Keep wildlife populations in balance with habitat conditions.

Terrestrial Wildlife

Most of the habitat in the Watershed is forest. There are also about 16 acres of fields that are maintained as permanent openings for wildlife. Most of the wildlife species found here are typical of forests in the general area, including birds such as turkeys, ruffed grouse, and numerous species of raptors and songbirds; mammals such as white-tailed deer, gray fox, bobcat, raccoon, opossum and gray squirrel; and reptiles such as timber rattlesnake and copperhead snake. There are likely to be coyotes and black bears that have moved into the area in recent years. Rock cliffs and other steep rocky areas on the Watershed provide den sites for some of these creatures, so this should be taken into account when planning any silvicultural activity. Hunting is a common recreational activity in the Watershed. While white-tailed deer are common in the Watershed, the relatively heavy hunting pressure keeps the population in balance with the habitat to a greater degree than most forests in Frederick County, and to a much greater degree than other public properties on Catoctin Mountain (15-20 per square mile on the Watershed compared to 122 per sq. mi. at Catoctin Mt. Nat'l Park [survey by Scott Davis, NPS]). This allows the possibility of desirable native tree regeneration (as long as other conditions are suitable), and gives a greater chance of survival for rare native plants.

Fish

The streams in the Watershed are home for a variety of fish and other aquatic organisms. Maryland DNR Fisheries Service is primarily concerned with trout in the watershed, although they also are interested in other species of fish and invertebrate animals, especially in relation to trout habitat.

Trout are found in both forks of Fishing Creek above the reservoir and in the headwaters of Tuscarora Creek, especially Clifford Branch. Native reproducing populations of brook trout can be found in all of the above creeks, while rainbow trout are only found in the Left Fork of Fishing Creek. The rainbow trout are stocked each trout season. Rainbow trout can also be found in Hamburg Pond and Whiskey Springs Pond along with bass and bluegill. Both Hamburg Pond and Whiskey Springs Pond are considered "put and take" fisheries.

The brook trout have a self-sustaining population with in the watershed, but as development continues to creep up Tuscarora Creek, there is a possibility that the population may crash. The reason for the crash would be lack of a forested refuge place (a pool or downstream) to go to in times of drought. The brook trout are fairly small, with most less than 9 inches in length.

There are a few creeks and ponds on the watershed that are inhospitable to trout due to the low pH, less than 5. This is due to the geology of the area, which is acidic and has little or no buffering capacity. Acid precipitation, which is significant in the Watershed, also contributes to the problem. The acidity also limits the benthic macro-invertebrate population in these streams. Addressing the low pH through lime-dosing or similar means is not currently a priority because of the expense, and the fact that there is a good trout population in the other creeks.

Maryland Dept. of Environment (MDE) classifies all waterways on the Watershed as Use III waters, the most restrictive classification. Class III waters are "closed" to construction activities in-stream or in the floodplain from October 1 to May 1. Brook Trout spawn around the end of October. The hatching of the trout fry occurs around the end of March and the beginning of April. During this time the eggs and newly hatched fish are susceptible to excess sediment in the creek.

For fish, the protection of the streamside management zone (SMZ) is considered to be the most important factor. Equipment should not only be kept out of the stream channel, but also any associated wetlands, and any seeps or springs that feed into the creek. DNR Fisheries Service feels that as long as the stream quality is good and the riparian forest buffers are healthy, the population of trout will remain stable. Fishing pressure is not a problem at this time.

There is a high level of recreational fishing use of both forks of Fishing Creek. During the trout season, five (5) trout per creel per day can be kept in Left Hand Fork (Steep Creek) and two (2) trout per creel per day can be kept in Right Hand Fork (Little Fishing Creek). There are no known fly-fishing groups with a specific interest in improving stream habitat in the creeks on the Watershed, since the conditions are already good and there are other creeks of higher priority.

Information for the preceding section on fish was provided by John Mullican, Natural Resources Biologist, DNR Fisheries Service.

Detailed information about the wildlife attributes of the property is included in the NED reports for each compartment.

The recommendations for wildlife habitat on the property are:

- Create and perpetuate a forest with a good distribution of age and size classes, and a variety of tree species.
- Maintain an adequate number of den trees, snags, and large mast producing trees, and an adequate volume of coarse woody debris.
- Maintain and expand permanent openings by removing trees, liming & fertilizing periodically, and planting, disking, mowing, etc. as per Wildlife Biologist w/ DNR Wildlife and Heritage.
- Keep wildlife populations, particularly deer, in balance with habitat by recreational hunting.

- Maintain high quality fish habitat through use of streamside management zones and other practices described in the section on Water Quality.
- Control invasive exotic plants to the greatest extent practical.

FOREST PRODUCTS

Objective - To manage the forestland to provide sawtimber and other wood products on a continuing basis

- Produce forest products in a sustainable manner to provide for local needs, benefit the local economy, and produce income to offset other management expenses.
- Use harvesting of timber, where appropriate, to address other management objectives such as wildlife habitat modification, wildfire hazard reduction and susceptibility to forest pests.

There are currently 170,000 to 180,000 board feet of sawtimber and about 80,000 cords of pulpwood-sized material growing on the watershed. This timber has a value – if it were all cut, which is definitely not recommended – between $2 million and 4 million dollars. Most of the timber on the Watershed is small due to the extensive mortality that followed the gypsy moth infestation of the 1980's, which points out the great economic loss that occurred. The loss is made worse by the fact that many of the young trees that replaced the more valuable oaks are low-value species, red maple and black gum. Most of the timber found here is just approaching the size that has commercial value, and further growth over the next twenty years will greatly increase the value, especially if measures are taken to promote the growth and vigor of a variety of desirable tree species, and the forest is protected from catastrophic loss.

One of the basic aspects of scientific forest management is *silviculture*, the art and science of controlling the establishment, growth, composition, health, and quality of forests to meet the needs and values of landowners and society on a sustainable basis. Much of this Forest Stewardship Plan is based on silvicultural management to achieve the stated objectives.

There are various "green" certification programs available that recognize a forest management program as being sustainable and inclusive of a variety of natural resource values. Some of these are the Sustainable Forest Initiative (SFI), the Forest Stewardship Council (FSC), and the American Tree Farm System (ATF). Participation in some of these programs is difficult and expensive. The Tree Farm System is relatively easy and inexpensive, and would be an advisable first step. Other municipal watershed properties, such as the Hagerstown Watershed, participate in this program.

Detailed information about the forest product attributes of the property is included in the NED reports for each compartment.

The recommendations for forest products on the property are:

- Implement the long-term sustainable timber management program based on a detailed inventory of current conditions and on desired future conditions that is included in this Forest Stewardship Plan.

- Work toward developing a forest that has a balanced distribution of tree ages, sizes and species that can eventually provide a fairly even flow of forest products of a quality and quantity consistent with the capacity of the land.
- Take advantage of fluctuations in market conditions and emergence of new market opportunities to maximize value received for forest products harvested.
- Consider participating in a certification program for forest sustainability.

EDUCATION

Objective - To allow limited educational use of the land as a means to better appreciate and understand our environment.

- Provide opportunities for outdoor education for the general public and schools.
- Provide opportunities for research and demonstration of watershed management, forest ecology, forestry, wildlife management, and related topics.

The Watershed is used for field trips and workshops on Stream Ecology by Hood College. While there are likely other educational activities that take place in the watershed, we are not aware of any direct information about these. Some research projects currently underway on the watershed include stream ecology effects of hemlock wooly adelgid along Right Hand Fork, and control methods for hemlock wooly adelgid in Fishing Creek immediately above the reservoir.

The recommendations for providing educational opportunities on the property are:

- Allow and encourage educational institutions, including secondary and college levels, to utilize the property for classes, demonstrations, etc. with prior approval.
- Assist with research into American chestnut restoration by allowing American Chestnut Foundation members to identify and collect seed from potentially blight resistant mother trees; and to later allow test sites or restoration plantings to be established in designated areas consistent with this plan (e.g., regeneration harvest sites).
- Allow other scientific research projects to take place that will increase knowledge of forests, forestry, wildlife management, water quality, other natural resource issues, and historical aspects of the property. <u>However</u>, only research projects that are consistent with this plan should be approved.

RECREATION

Objective - To provide recreational opportunities to the public in accordance with the enclosed city ordinance.

- Provide opportunities for public recreation such as hunting, fishing, hiking, bird watching, mountain biking and horseback riding.
- Prevent or minimize activities that are incompatible with other objectives of the plan or are unlawful, destructive or hazardous.

Recreational in the Watershed has long been an important use, and it is becoming even more important as the population in this area grows and relatively new activities gain in popularity. Recreational activities include hunting, fishing, hiking, horseback riding, bird watching, rock climbing, cycling (road), and mountain biking. "Illegal" uses such as off-road vehicles, ATV's, and drinking parties are unfortunately also common. While recreational uses generate no income to the City, they are important economically, both locally and in the economy as a whole, and it provides a valuable social and spiritual outlet for many people. Hunting, especially for deer but also for other forest game species, has always been one of the most common uses. Fishing for trout, both stocked rainbow trout and native brook trout, takes place in the several main streams, and stocked trout are caught along with bass and bluegill in the various ponds. Hiking, cycling, horseback riding, and mountain biking take place on the public roads and trails. The most heavily used trail is the blue-marked Catoctin Trail, which winds in a north-south direction from the top of Catoctin Mountain National Park to Gambrill State Park, passing through the watershed for 9.5 miles. Some sections of this trail need to be relocated, and other areas better drained or stabilized. There are many miles (perhaps as many as 100 miles) of lesser trails and old logging or charcoal roads on the property. Some of these are used very little, and some are very heavily used. Many of the old roads and trails, and some of the new "renegade trails" created by 4-wheel drive vehicles, ATV's and mountain-bikers, are poorly located and could cause erosion and sediment problems. While Frederick regulations prohibit off-road vehicle use (which would include ATV's), the influx of mountain bikers could not have been foreseen by the City when they devised their regulations in 1974. Consideration should be given to delineating certain trails, even additional trails, for mountain bikers, and prohibiting their use of other trails. Relationships with various user groups such as the Potomac Appalachian Trail Club (PATC), Mid-Atlantic Off Road Enthusiasts (M.O.R.E.), Mountain Club of Maryland, Webmountainbike, Maryland Horse Council, and businesses such as outfitters, equipment companies and local retail stores should be fostered. These can be used to maintain trail clearance and drainage, cleanup trash, mark trails, close trails, and generally help assure safe and environmentally sound conditions. Grant money is available to help fund trail installation or improvement. The Maryland Park Service and the National Park Service are excellent sources of information on trails, recreational uses, and contacts with user groups.

The recommendations for providing for recreation on the property are:

- Limit heavy recreational use (horseback riding, mountain biking) to a few well-located trails.
- Relocate several sections of the Catoctin Trail to provide a safer and less environmentally damaging location, and improve other existing sections.
- Consider creating new trails (perhaps incorporating sections of existing ones) for mountain bikers, which would be well located and environmentally benign.
- Maintain roadside signs and boundary marking identifying the Watershed property.
- Post and distribute to visitors, neighbors, and user groups regulations for use of the property and maps of the property showing appropriate trails to use.
- Enforce laws and regulations on use of the property, especially the prohibition of motorized vehicles and dumping, to the greatest extent practical and reasonable.
- Make law enforcement officials, including Natural Resources Police, Frederick County Sheriff's Dept., and Maryland State Police, and City of Frederick Police, as well as Frederick Dept. of Public Works personnel, aware of the regulations that apply to the Watershed and the boundaries of the property.
- Foster relationships with recreation user groups, and seek grant funds, to improve trails and other recreational attributes of the property.

AESTHETICS

Objective - To maintain the aesthetic integrity of the forest along major travel routes, streams and other critical areas.

- Minimize visual impacts of harvesting, mortality from insects and disease, and other effects, especially adjacent to main travel corridors and other public use areas.

Aesthetic values are among the most difficult to assess or quantify. Conditions that some persons may find objectionable will be innocuous or positive to others, depending on his or her background and interests. For example, woody residue on the forest floor following logging may look messy to many but provide positive benefits such as protection of new tree seedlings from deer browsing, recycling of nutrients, and wildlife habitat elements. Standing dead trees may look ugly, hazardous or wasteful to some, but to others may be deemed a normal part of forest processes and a boon to certain wildlife species. However, it can generally be said that many people find to be objectionable a close up view of intensive harvesting practices, large numbers of dead or dying trees, forest fires, and similar practices that create disturbance. One advantage of the large number of red maple and black gum now found on the Watershed is their excellent autumnal coloration, especially as compared to oaks. The hemlock found near Fishing Creek and its tributaries provide a truly beautiful setting, and other conifers also contribute to the color and texture contrast of the forest, especially in winter. Aesthetic qualities of autumnal coloration, spring flowering, and evergreen contrast can be provided by a variety of tree and shrub species, and this variety will be less likely to experience large-scale mortality. The priority areas are those in which the general public would be likely to see – including roadsides of the more heavily traveled roads - Gambrill Park Road and Hamburg Road, and large slopes facing Rt. 15.
Detailed information about the aesthetic attributes of the property is included in the NED reports for each compartment.

The recommendations for protection of aesthetic values on the property are:

- Limit timber harvesting and road building in streamside management zones, steep slope areas, and the Fishing Creek Natural Area as described in previous sections.
- Leave a buffer of trees between heavily traveled roads and regeneration harvest areas, and where appropriate employ the practice of harvesting these buffer zones several years prior to the adjacent regeneration harvest to allow the development a dense strip of young trees that provide a better screen.
- Remove, or reduce the height of, woody debris from timber harvesting within a 50 foot section adjacent to public roads.
- Locate timber harvest loading areas away from roadsides, and design entrance roads to loading areas in a curved or angled manner that tends to obscure them from view from the road.
- Avoid or limit timber harvesting on large areas facing Rt. 15.

- Promote the maintenance or development of a forest with a variety of tree and shrub species.
- Minimize disturbance associated with roads and trails, control erosion and seed and mulch sloping areas of exposed soil.
- Do as much as feasible to prevent to loss of the hemlock, as described in the section on Forest Health.

RARE, THREATENED OR ENDANGERED (RT&E) SPECIES

- Protect RT&E species from disturbance that may affect long-term survival.
- Provide for the maintenance and perpetuation of critical habitats for RT&E species.

There are 10 species of plants, one insect and one mammal that have been observed on the Watershed that are listed as being rare, threatened, or endangered within Maryland. There are no Federal-listed RT&E species found here. The exact locations of these species are not publicized. Most of these species are found in low areas along waterways, and in steep rocky areas, particularly within the Fishing Creek Natural Area described later. Other than directly impacting these species by road or trail construction, off-road vehicle and ATV use, harvesting timber, removal by collectors, etc., indirect impacts such as isolation from others of the species, changes in water quality, changes in the composition of the forest, and invasion of alien plant species can also cause the decline or elimination of these species from a given area. The RT&E species observed here (as well as a two other uncommon plants) are included in the following chart.

Sensitive Species for Frederick City Watershed

Information provided by Lori Byrne (2004), and Ken Hotopp (1991) MD DNR Wildlife and Heritage Service.

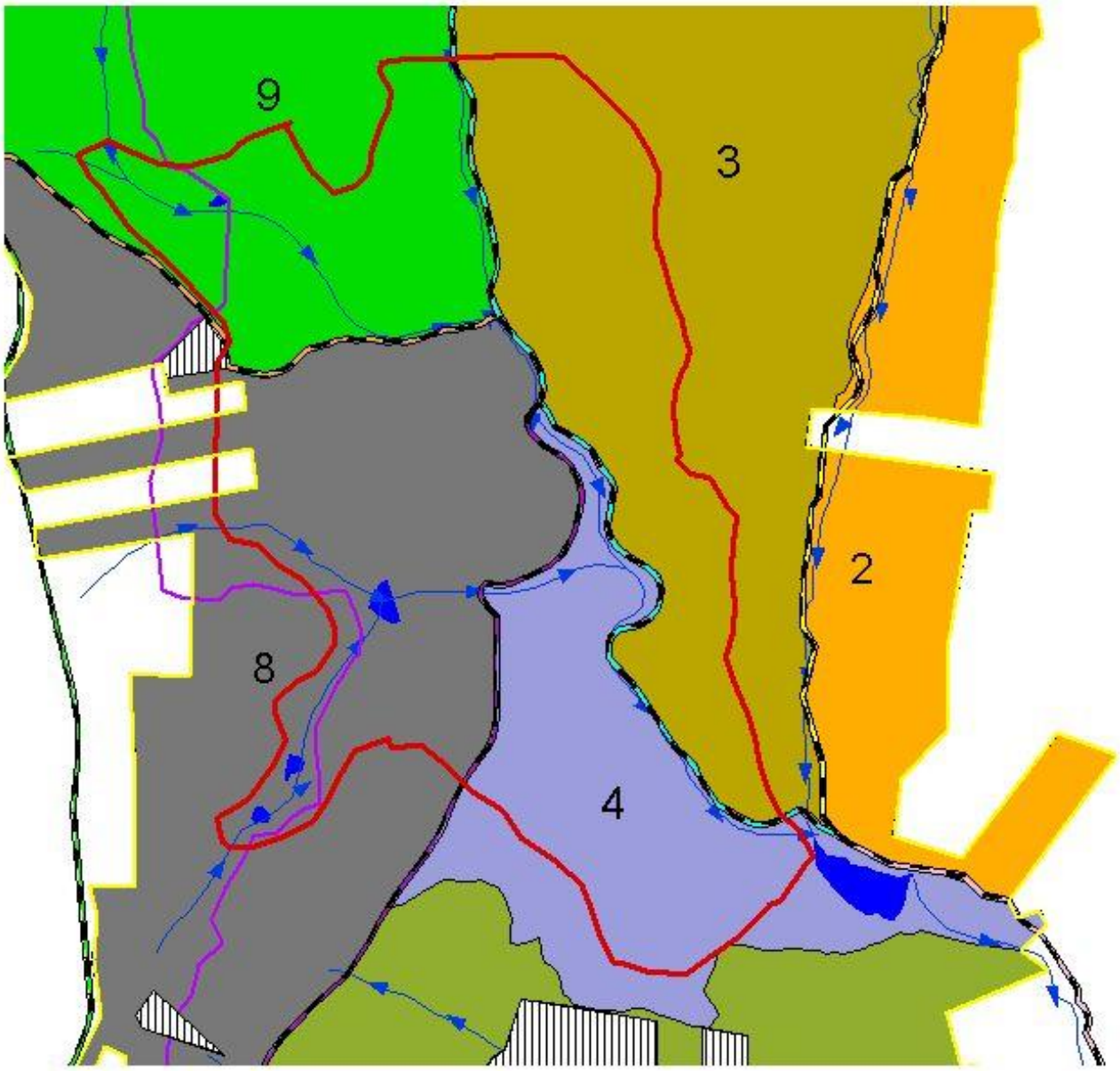
PLANTS

Common Name	Scientific Name	Type of Plant	State Status	Indicator Classification
Large Purple Fringed Orchid	*Plantanthera grandiflora*	Herbaceous	Threatened	Facultative Wetland
Small Purple Fringed Orchid	*Plantathera psycodes*	Herbaceous	Endangered	Facultative Wetland
Yellow Fringed Orchid	*Plantanthera ciliaris*	Herbaceous	Threatened	Facultative Wetland
Climbing Fumitory	*Adlumia fungosa*	Vine	Threatened	Obligate Upland
Floating-heart	*Nymphoides cordata*	Aquatic	Endangered	Obligate Wetland
Yellow Nodding Lady's-tresses	*Spyranthes ochroleuca*	Herbaceous	Endangered	Facultative
Bog Clubmoss	*Lycopodium inundatum*	Club moss	Rare	Obligate Wetland
Mountain Sandwort	*Minuartia glabra*	Herbaceous	Endangered	Obligate Upland
Running Juneberry	*Amelanchier stolonifera*	Shrub	Threatened	Facultative Upland
Sharp-scaled Mannagrass	*Glyceria acutiflora*	Grass	Endangered	Obligate Wetland
Round-leaved Sundew	*Drosera rotundifolia*	Herbaceous	N/A	Obligate Wetland
Bladderwort	*Utricularia geminiscarpa*	Herbaceous	N/A	Obligate Wetland

ANIMALS

Common Name	Scientific Name	Type	State Status	Habitat
Edwards' Hairstreak	*Satyrium edwardsii*	Insect (Butterfly)	Endangered	Dense scrub oak (*Quercus ilicifolia*) thickets among open woods and rocky open habitats including sand barrens, shale barrens, and limestone ridges.
Allegheny Woodrat	*Neotoma majister*	Mammal (Rodent)	Endangered	Rocky cliffs, caves, ridge crests, and overhangs. Speculation decline related to chestnut blight and gypsy moth

FISHING CREEK NATURAL AREA



City Watershed Boundary

Fishing Creek Natural Area

- Natural Area

Roads and Trails

- Left Hand Fork Rd
- Gambrill Park Rd
- Right Hand Fork Rd
- Mountaindale Rd
- Delauter Rd
- Fishing Creek/Cold Deer Rd
- Hamburg Rd

Roads and Trails

- Hiking
- Streams
- Ponds/Lakes

Compartments

- Inholding
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

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FREDERICK CITY WATERSHED

Fishing Creek Natural Area

The Fishing Creek Natural Area includes much of the central part of the Watershed, along both sides of Fishing Creek. In 1991 a proposal was made by MD DNR Wildlife and Heritage, and accepted by to the City of Frederick, to designate this area for special consideration due to the presence of certain special habitats and RT&E species. The mixed woods above Fishing Creek have sandstone outcrops where the Allegheny Woodrat dens and the white-flowered Climbing Fumitory vine grows in openings. The Woodrat is a type of packrat that collects sticks and other objects for its "debris pile" in the rocks. Small man-made ponds in the drainage are home to the state-endangered Floating Heart, named for its heart-shaped floating leaf. The ponds also have one of the few populations of the bladderwort *(Utricularia geminiscarpa)* found away from the coastal plain. Wet soils near the ponds hold the Round-leaved Sundew and Bog Clubmoss. An amazing variety of orchid flowers inhabit the woods of this natural area, 11 species, including the state-threatened Large Purple Fringed Orchid and Yellow Fringed Orchid. Fishing Creek Natural Area also has one of the state's very few populations of the unusual white form of the common Pink Lady's Slipper *(Cypripedium acaule)*. Logging, road building, and damming pose the major threats to rare species in this natural area. Logging can change the microclimate and soil conditions beyond the tolerance of some rare species, or cause disturbance that allow weeds to invade a site. Although Climbing Fumitory likes some disturbed soil, it can be eliminated by the changes caused by clear cutting. Orchids require special soil fungi to help them gather nutrients, a delicate relationship that can easily be disrupted. Woodrats use the mast (nuts and seeds) produced by mature trees. To help protect the rare species found here, logging should favor selective harvesting, and should avoid all rare plant and animal sites by at least 300 feet. Road building can displace rare species, or cause erosion that destroys habitat. New roads should not be built within the natural area. If construction is unavoidable, it should stay away from rare species sites. Damming and subsequent flooding in the Fishing Creek valley would pose a serious threat to the species growing lowest in the drainage.

The information above on the Fishing Creek Natural Area was derived from a summary prepared in 1991 by Ken Hotopp, MD DNR Wildlife and Heritage Service.

The recommendations for management of RT&E species on the property are:

- Consult with MD DNR Wildlife and Heritage Service before conducting any activities within the Fishing Creek Natural Area or near other locations where RT&E species are thought to be found.
- Provide an adequate buffer for road building and timber harvesting around all RT&E species.
- Control invasive alien plants to the greatest extent practical.
- Consider management practices that will perpetuate critical habitat components.

OTHER CONSIDERATIONS AND RECOMMENDATIONS

Boundaries

There are 28.6 miles of boundaries on the Watershed, both exterior boundaries and boundaries around in-holdings. In most areas the corners of these boundaries were marked with metal stakes and circular metal caps imprinted with numbers and identification as a corner for City of Frederick City Watershed Monument. Many of these corner markers are still intact, but a significant number are missing. On some corners the metal stakes have rusted off – or have nearly rusted off – and fallen over. Many other corner markers appear to have been deliberately removed or vandalized. It appears likely that in at least some locations the corner markers were removed by adjoining landowners in order to "expand their property" (or facilitate their exclusive use for hunting, etc.) or obscure the boundary of the city property to prevent public use. Except for the corners, generally there are no boundary marks along the Watershed property line, except in cases where adjoining landowners have marked them. The previous Forest Management Plan recommended marking the Watershed boundaries with paint, but this was never done. Boundaries are probably in dispute in some areas. In several cases, Maryland Forest Service personnel collecting data on Watershed property encountered areas believed to be City owned that were posted with signs by adjoining landowners, and in other cases State personnel were challenged and ordered to leave by neighbors claiming to own areas believed to be City owned. For example, permanent tree stands are nailed to trees (often the most valuable trees) and tree cutting (either for firewood or to provide visual clearance for hunting) are common near the boundaries and in one case there is a deck for a house that appears to be on or inside the Watershed boundary.

The recommendations for boundaries on the property are:

- All location and marking of property lines will need to be done under the supervision of a licensed surveyor.
- Begin to re-mark the corners in the same manner as previously done, replacing all metal stakes (possibly with heavier rust-resistant galvanized stakes) and replacing numbered monuments where missing. If too much to do at one time, this project could be completed over a period of years, possibly one compartment each year, starting with Compartment 4 (the smallest), and proceeding through the southern and western compartments (5 – 9) where the boundary problems are most serious, and ending in the northeastern compartments (1 & 3) where boundaries are not as much of an issue.
- Record the coordinates of the corner marks with GPS. Even if survey-grade GPS data is not collected, having a location with 2 – 10 meter accuracy will be valuable in finding corners in the future.
- Contact adjoining landowners to clarify the locations of corners and boundaries. This will alert neighbors that the boundaries are now clearly identified, and may prevent future misunderstandings and problems.

- Mark corners with witness marks in the form of painted blazes on trees. Even if the blazed trees are only on the Watershed property side, it will help in future relocation of corners and may discourage tampering by adjoining landowners.
- Mark boundary lines with painted marks or painted blazes. This should be done at the same time as the corner marking described above. Yellow highway marking paint works well for this purpose.
- Prior to marking any timber sale areas that adjoin private lands, property boundaries should be marked by the City.
- Maintain and re-mark boundaries about every 10 years.

Unwanted Human Activities

The most aggravating problems on the Watershed are unwanted human activities. Some of these activities include littering, dumping of trash, tires and yard waste (including plants that propagate), vandalism of gates, building tree stands by nailing into trees, off-road vehicles, ATV's, dirt-bike motorcycles, boundary-line encroachment, target shooting, suicides, dumping of stolen vehicles or murder victims, teen-age drinking parties, bonfires and campfires, and possibly even bio-terrorism activity. To a large extent the Frederick City Watershed is a "no-man's-land" where anything goes. The level of law-enforcement is low, most of which is provided by Maryland's Natural Resources Police (NRP), which has only a couple of officers per county. This staffing level may be increasing in the near future as part of a re-assignment of personnel that is currently underway. Some problems that hinder enforcement activities are the inability of NRP to enforce City ordinances, the difficulty in knowing the boundaries of the property, not knowing who may be a legitimate user of a road to a private in-holding, the fact that most of these activities take place in the evenings and on weekends, and the difficulty in catching somebody on an ATV. While there probably will never be a high level of compliance with all laws and regulations, an increase would be desirable and beneficial.

The recommendations for unwanted human activities on the property are:

- Mark and maintain boundaries as described in the preceding section.
- Post rules and regulations in prominent locations, and be prepared to replace them frequently.
- Make sure Natural Resource Police and other law enforcement officials (Sheriff's Department, State Police, City Police), as well as relevant City employees, are aware of boundaries, regulations that pertain to the property, and the desire to achieve a higher level of enforcement.
- Make sure that neighboring landowners are aware of boundaries, and restrictions on ATVs, tree stands, etc. and other regulations.
- Enlist neighbors and recreational users in reporting violations as well as refraining from these activities themselves.

American Chestnut

American chestnut was important in the development of the Catoctin Mountain area. Chestnut is a fairly solid and stable wood with significant rot resistance. It is estimated that chestnut once made up ¼ of the wood cut in the Appalachians. Chestnut was often used in construction as framing wood, structural timbers, siding, shakes, and shingles. When animals were penned up or gardens needed protection, chestnut was used for fence posts and rails. Chestnut was used as firewood, but was also made into charcoal along with the oak and the pine found on the forest. The charcoal was fuel, not only for cooking and heating, but also was used as fuel in iron ore smelting (Catoctin Furnace). It is estimated that approximately 30,000 – 35,000 acres were needed to support an iron furnace. Chestnut oil was also used with extracts from oak and hemlock in the leather tanning process (based in Thurmont).

Culturally, the chestnut had an important role. Chestnuts reliably produced a nut crop each year, unlike oak or other species. Native Americans and early settlers would rely on chestnuts as a source of winter food. There are historical references to settlers in the Appalachians turning pigs loose and having them eat the chestnuts to fatten up. The nuts also provided a cash crop. Roasted chestnuts were sold on many a street corner in the cities of the Northeastern US (Baltimore, Philadelphia, New York) as a snack. Most people recall the opening line to the "Christmas Song" (Chestnuts roasting on an open fire…).

Chestnut timber was used in the construction of colonial settlers homes and barns. The wood in many old barns and houses are "recycled" to reuse the chestnut beams and boards. Besides its use in construction, chestnut was also manufactured into furniture; it was easily machined and worked.

Ecologically, chestnut grows on the upper and mid-slopes of mountainous areas on well-drained soils. It had similar growing characteristics to yellow poplar (*Liriodendron tulipifera*); fast growth, a very straight trunk, and a pioneer species on old fields and cleared areas. Because of the chestnut blight, chestnut has become a small tree instead of a dominant forest tree. American chestnut also had a very significant impact on the forest when chestnut blight struck around the 1900's and killed them; oaks became the dominant forest trees.

Chestnut blight (*Cryphonectria parasitica* [syn. *Endothia parasitica*]) is an introduced fungal disease. It arrived in the United States about 1900. The disease is believed to have come from Asia, as evidenced by the resistance of Chinese chestnut to the pathogen. The disease causes a canker that kills bark, cambium and sapwood, and leads to chestnut mortality. The blight fungus also infects oaks and chinkapins, but it does not kill them, thus allowing more fungus spores ready to infect susceptible trees. Chestnut blight can be seen in the Frederick City Watershed on the remaining chestnut trees. It shows up as either a bulls-eye shaped canker or as an orange or yellow orange colored substance in the cracks created in the chestnut's bark as the tree enlarges. There are hypo-virulent forms of the pathogen, but it is unknown if these can be found on the property. Hypovirulence is a virus disease of the blight fungus (ACCF

2005). The spread of the fungus through tree tissues is slowed down because of the attacking virus. The tree then has a better chance to resist the blight through its normal defenses. The hypo-virulent form attacks the tree but does not kill it.

Since the disease quickly kills the above ground portion of the chestnut trees, but does not directly affect the roots, the root systems often remained alive. These root systems would resprout, grow for about 5 – 10 years, become infected with the disease and die back to the roots again. This re-infection and die back often occurs during the first year the tree flowers and produces nuts, and this biological burden is probably what leads the trees to be more susceptible to the disease. This cycle of resprouting and die-back continues until the roots eventually die off from lack of enough sunlight to re-supply carbohydrate reserves in the roots. Closed canopies discourage chestnut survival, while available sunlight allows it to persist.

American chestnut once made up a significant proportion of the trees on the Watershed. It was able to produce highly quality timber on sites that have fairly poor productivity for other desirable timber trees, and was able to resprout from the roots following fire or harvesting. The disease arrived in this area about 1918, and mortality of the trees soon followed. Much of the dead chestnut timber in accessible areas would probably have been harvested in the 1920's and 1930's. The principal trees to fill in the void left by the loss of the chestnut on the Watershed were chestnut oak and scarlet oak.

Many chestnut sprouts from old root systems still persist on the Watershed, particularly in areas that were clearcut following gypsy moth mortality. Due to shading, areas that were not harvested have fewer chestnut sprouts surviving. Some of sprouts live long enough to produce nuts before succumbing to the disease. These remaining sprouts and nuts represent an important reservoir of the genetic material for the American chestnuts that were native to this locality. The depletion of these root systems and sprouts would mean a loss of potential uses for breeding programs or to build up fungus populations weakened by introduction of a hypo-virulent strain of the disease.

There are two non-profit organizations that are active in chestnut research and restoration: the American Chestnut Foundation (TACF), based in Bennington, Vermont, which now has a chapter that is active Frederick County, and the American Chestnut Cooperators' Foundation (ACCF), based in Blacksburg, Virginia. Both organizations not only have ongoing projects that they are involved with but they also cooperate with each other, especially information on blight resistance.

The TACF has primarily been cross breeding American chestnut with Chinese, Japanese, and European chestnuts. The exotic chestnuts have resistance to the blight pathogen, and by cross breeding, hopefully the American chestnut can pick up the genes responsible for resistance but hold on to the characteristics that make it American chestnut. So far using this method, some resistance has been seen in the trees that have been planted.

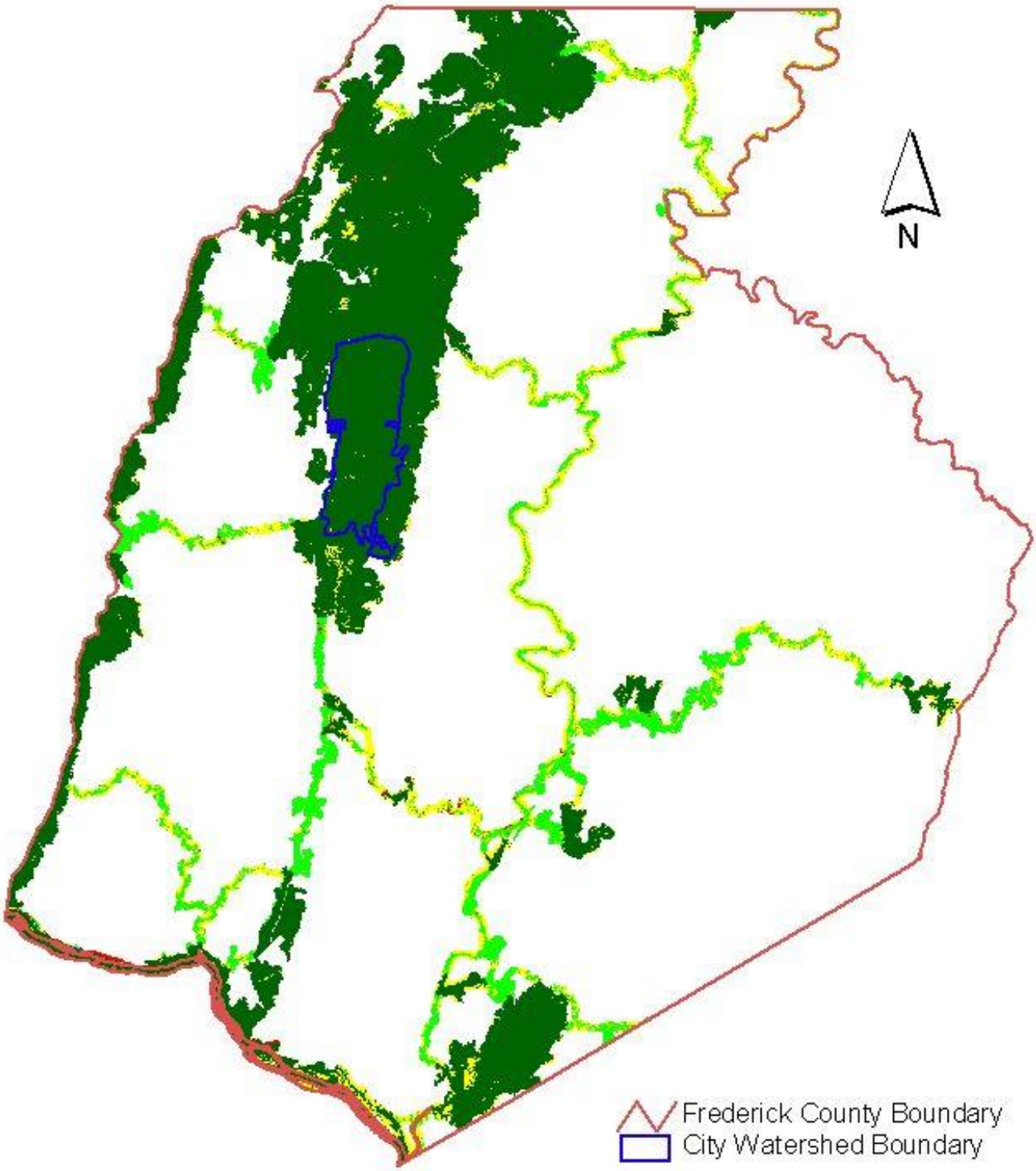
The ACCF is involved with graduate and undergraduate student research projects at Virginia Tech, in Blacksburg, VA and at Concord College in Athens, WV. The ACCF's focus has been on cross-pollinating only American chestnuts that show signs of blight resistance. They do not cross-pollinate with exotic chestnuts. They also have been looking at hypovirulence related to integrated blight management. Integrated management uses several tactics to control the blight fungus; these include using bio-controls such as hypovirulence, planting chestnut on sites where vigorous growth can be maintained, and developing blight resistant varieties of American chestnut. There are also some university researchers trying to do gene splicing to transfer resistance. This however is still in the experimental stage. TACF is hoping to have a blight-resistant strain of chestnut ready for planting by 2015. This would greatly improve wildlife habitat through the production of desirable hard mast.

The recommendations for American chestnut restoration on the property are:

- Work with the local chapter of The American Chestnut Foundation to identify and collect nuts or graft material from some of the many chestnut re-sprouts on the property that may have some resistance to the blight or to include local genes in breeding programs.
- In areas where regeneration harvests are carried out, establish test plots where potentially resistant stock could be planted and evaluated.
- Once reliably blight resistant stock is available, work to make chestnut a significant part of the forest community once again.

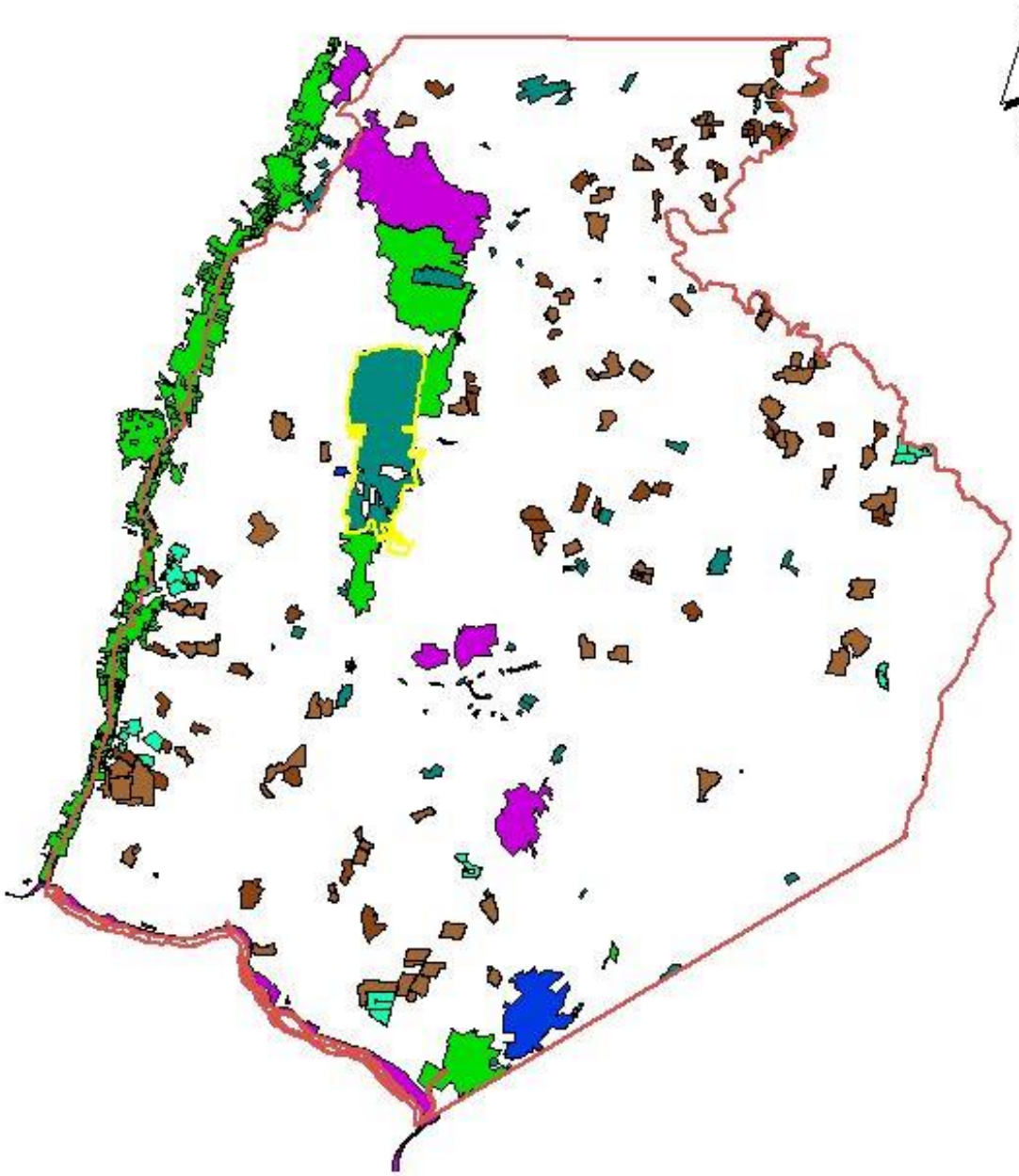
Importance of the Frederick City Watershed at the Landscape Level

The Frederick City Watershed is a keystone in the overall ecosystem and land use structure within Frederick County, the State of Maryland, and the Mid-Atlantic Region in a number of ways. The Watershed links with other public lands – Gambrill State Park with Cunningham Falls State Park and Catoctin Mountain National Park – to form a direct connection, and indirectly connects with public lands on South Mountain (South Mountain Recreation Area, Greenbrier State Park, Washington Monument State Park, Gathland State Park). Combined with adjacent or nearby private lands this creates a critical mass that provides values and opportunities that cannot be provided by smaller and more fragmented units of land. The large connected public ownerships provide recreational opportunities that would not be possible if parts of the puzzle were sold off into private hands. Most importantly, this area provides contiguous habitat for animals that have large home ranges or need to move from one type of forest habitat to another during various seasons or parts of their life cycle. This area provides habitat for animals that do not do well in proximity with people. Adjacent and in-holding landowners, especially those with year-round homes (as many seasonal homes eventually become) have a low tolerance for predators and snakes, especially rattlesnakes, tend to use access roads repeatedly every day regardless of weather or ground conditions, have dogs and cats that take a toll on small mammals and birds (e.g., Allegany Woodrats probably wouldn't last long next to a home). Residents tend to be intolerant of hunting or timber harvesting next to their property. The large block of connected forest also



FREDERICK COUNTY GREEN INFRASTRUCTURE

FREDERICK COUNTY CONSERVATION LANDS



City Watershed Boundary
Private Conservation Lands
MD Environmental Trust Lands
Federal Lands
State Lands
County Lands
Agricultural Preserve Lands

provides the opportunity for exchange of genetic material within a given species so that populations do not become isolated and inbred.

The recommendations for landscape level protection on the property are:

- Keep the property in public ownership.
- Do not sell off any portions of the property, and acquire in-holdings or adjacent properties as they become available.
- Do not grant access rights or allow new roads to be built into in-holdings.
- Work with conservation easement organizations to acquire development rights to in-holdings or adjacent properties that want to retain ownership.

GENERAL FOREST DESCRIPTION

There are approximately 7006 acres of forest found on the Frederick City Watershed. The forest found here is characterized as ecological land type M221, Central Appalachian Broadleaf Forest – Coniferous Forest – Meadow (Bailey 1994). Braun (1950) describes this area as the Northern Blue Ridge physiographic province of the Oak-Chestnut Forest Region, though the chestnut is basically extirpated. The average annual precipitation is 42 inches per year. The trees that make up the forest canopy of the Watershed are primarily upland hardwoods. Detailed descriptions of the forest types found on the Watershed are included in the section on silvicultural management and the various stand descriptions.

Tree Species

There are twenty-eight overstory tree species that were found in sample plots, and there are undoubtedly more present that were not encountered. Other species were found only as understory trees and shrubs. Detailed information on understory species is found in the appendices of the various compartments.

The seven most dominant species on the Watershed, in terms of overstory basal area (a measure similar to volume), are:

Chestnut Oak – 22%
Red Maple – 19%
Black Gum – 16%
Scarlet Oak – 16%
Tulip Poplar - 5%
Black Birch - 4%
Northern Red Oak – 3%

Tree species that make up approximately 1% each of the overstory basal area: Sassafras, Pitch Pine, Black Oak, White Oak, Pignut Hickory, Black Cherry, Eastern Hemlock, Mockernut Hickory.

Other overstory tree species found that make up less than 1% of the overstory basal area:
Bigtooth Aspen, Black Locust, American Chestnut, Tree-of-Heaven, Eastern White Pine, White Ash, Red Pine, Table Mountain Pine, American Beech, Virginia Pine, Sweet Cherry, Sycamore, Slippery Elm, Shagbark Hickory, Pin Cherry, and Persimmon.

The relative proportion of conifers, 2.8%, is significantly lower than the minimum 5% that is needed to provide an appropriate diversity of tree species. The relative proportion of oaks, 43.4%, is close to the 40% thought to be appropriate to meet the wildlife and forest products objectives without unreasonable risk from gypsy moth or other oak pathogens. This indicates that some oaks can be harvested in silvicultural activities, but not in large numbers, and not without regeneration of oaks. This points

out that there is very little regeneration of oaks except in the areas that were clearcut following the gypsy moth induced mortality. The proportion of “other hardwoods” is good, but the species composition of this group contains too much red maple and black gum.

The size class distribution for the property as a whole is not well-balanced, with no stands made up primarily of seedlings, few stands made up primarily of saplings (these resulting from the salvage harvesting), and few stands comprised of large sawtimber-sized trees (greater than 16 inches diameter). The amount of small sawtimber-sized trees (11 – 16 inches) is good, but there is too high a proportion (62%) of pole-sized trees (5 – 10 inches).

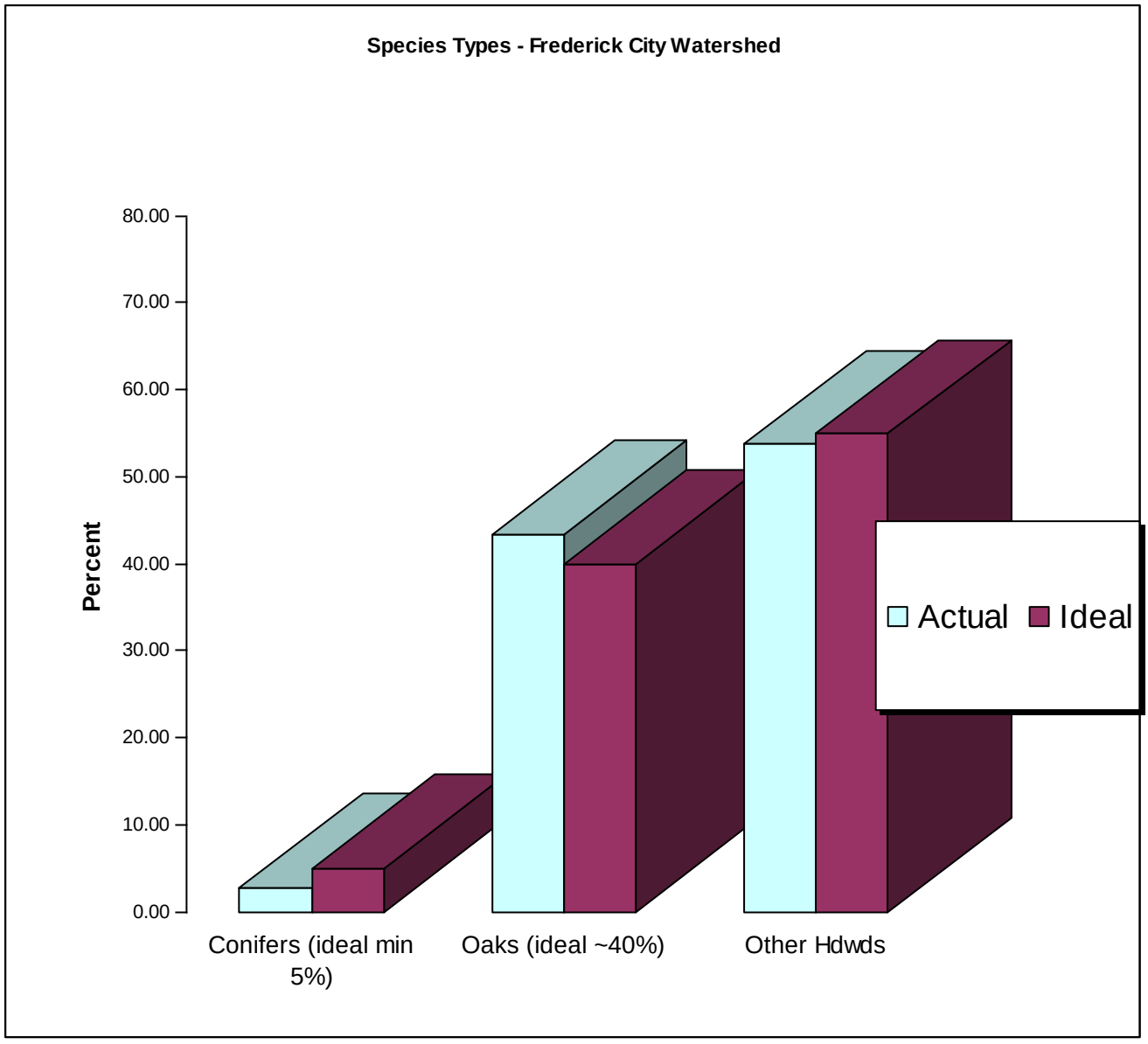
Shrub and Groundcover Species

The most common understory and groundcover species present on the watershed are mountain laurel, high-bush blueberry, low-bush blueberry and huckleberry. These are all ericaceous plants, members of the heath family with thick, sometimes evergreen leaves (mountain laurel) that are tolerant of shade, can grow in poor acidic soils, and usually grow thickly. These provide good cover for wildlife, and soft mast (fruit from blueberries and huckleberries) in summer. They are capable of burning with great intensity (especially mountain laurel), so pose an accelerated hazard for wildfire, and they often grow so thickly that they prevent regeneration of other trees and shrubs. The blueberries were once commonly collected in the Watershed and other nearby areas, and fires were sometimes set to promote their growth. These species, especially mountain laurel, increased in extent and density following the gypsy moth induced mortality of the 1980s.

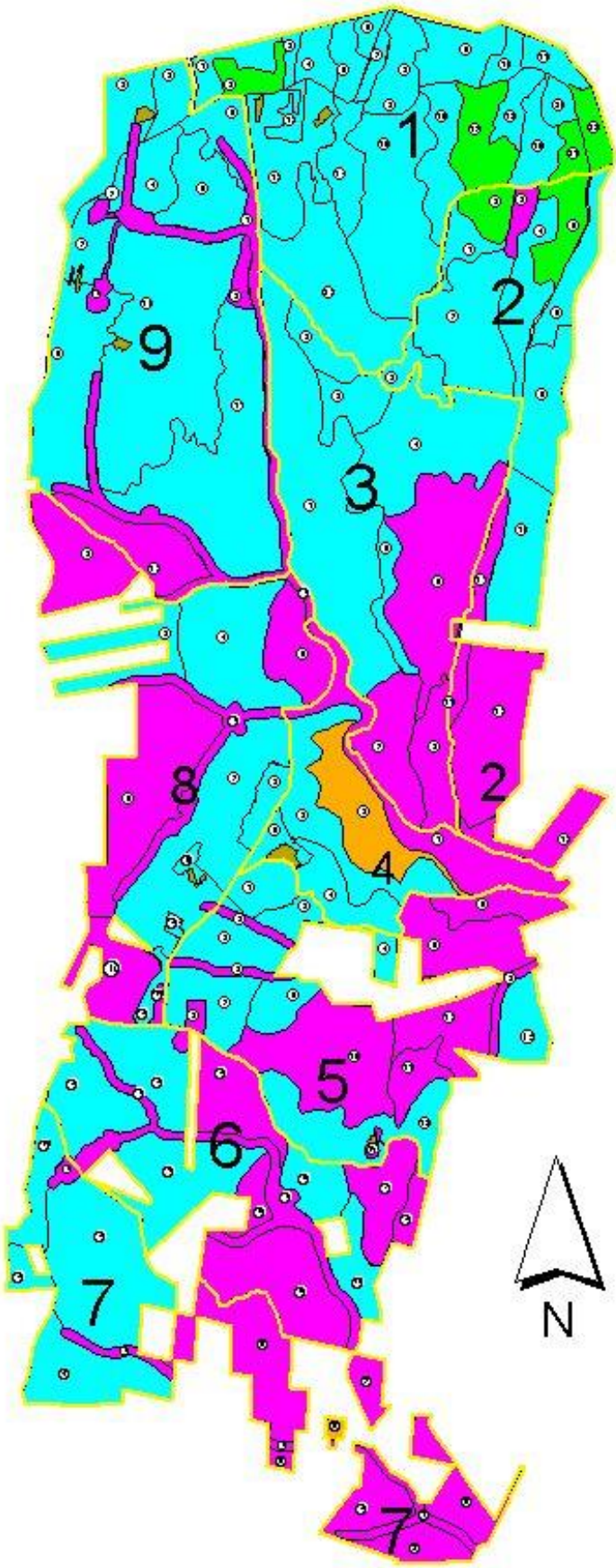
Other small woody plants commonly found here include serviceberry, witch-hazel, greenbrier, azalea, bear oak, gray dogwood, spicebush, winterberry, blackberry, wintergreen, grape and Virginia creeper.

Non-woody plants commonly found here include various ferns, especially hay scented fern (which is becoming more common since deer don’t like to eat it), and various rushes and sedges in wetter areas near the streams. There is not a large amount of grasses other than the Japanese stiltgrass that is invading the entire area.

A great deal of information on the various plant species found on the Watershed and their extent is included in the appendix NED information for each compartment.


Species Types - Frederick City Watershed
Percent
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Actual
Ideal
Conifers (ideal min 5%)
Oaks (ideal ~40%)
Other Hdwds

STAND TYPE



LEGEND

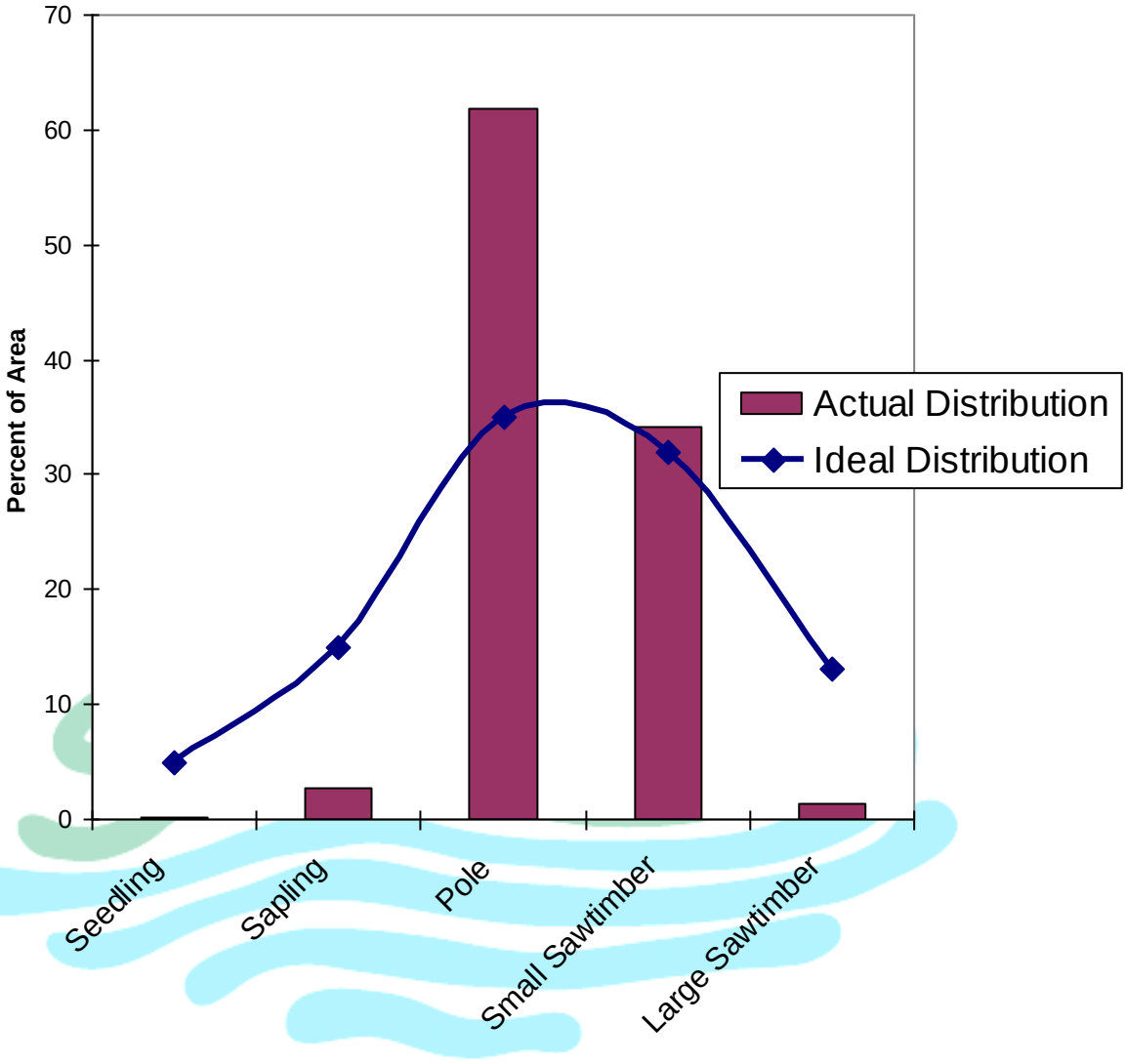
Compartments

Stand Type

- Field
- Sapling
- Pole
- Small Sawtimber
- Large Sawtimber

FREDERICK CITY WATERSHED

Size Class Distribution - Frederick City Watershed



GENERAL FOREST RECOMMENDATIONS

Due to the species composition and distribution of diameters few of the stands on the watershed are suitable for uneven-aged management, with the exception of the stands near Fishing Creek that have a lot of hemlock, though no silvicultural work is proposed for those areas. Most of the forest on the property is best managed under an even-aged silvicultural system. In order to balance forest health, wildlife habitat, and forest products issues, it is recommended that conifers comprise at least 5% of stocking, and oaks comprise about 40%, but not more than 50%. The proportion of conifers is lower than the minimum recommended, and most of those present are biologically mature. In order to increase the conifer component pines should be encouraged to regenerate through leaving of any potential seed trees during harvest, and possibly site preparation through prescribed burning to encourage natural regeneration, and/or planting of a few selected areas. The proportion of oaks on the property is slightly higher than optimum but is in an acceptable range. Oaks can be included in timber harvested, though regeneration of oaks will be important. When possible, and appropriate to the particular site, a diversity of trees with value for timber and/or wildlife, such as hickory, yellow birch, black cherry, white ash, sugar maple and aspen, should be encouraged. American chestnut should be re-introduced if and when reliably blight-resistant stock becomes available.

The size classes are too heavily composed of pole -sized trees, with almost no stands consisting of seedlings, saplings or large sawtimber trees. In the near term it would be appropriate to minimize cutting of sawtimber-sized trees, and concentrate on thinning pole and small sawtimber stands as soon as it is practical in order to speed their growth to larger size, as well as carrying out regeneration harvests in some stands as soon as practical to create some stands comprised of seedling and sapling sized trees.

SILVICULTURAL RECOMMENDATIONS

Silviculture – *The art and science of controlling the establishment, growth, composition, health, and quality of forests to meet the needs and values of landowners and society on a sustainable basis.*

Important note about recommendations
The recommendations provided in this document are a guideline for planning purposes. The Watershed property is large, diverse, and constantly changing. These recommendations will need to be adjusted as needed by an experienced Forester to fit particular needs, opportunities and conditions. For example, the timing of a particular practice may be advanced or delayed, stand boundaries may need to be adjusted, or the type of harvest may be modified.

TYPICAL RECOMMENDATIONS USED IN THIS PLAN

No silvicultural work planned
This pertains to areas not recommended for harvest due to ecological, cultural or logistical limitations, e.g., too steep, lack of access, streamside management zones, or the presence of rare, threatened or endangered (RT&E) species of plants or animals.

No silvicultural work needed
This recommendation typically applies in areas that may be appropriate for future improvement work or harvest, but no work is needed during the 20 year planning period covered by this plan. For example, the stocking may be adequate, the tree size small, and/or the volume too low for a commercial harvest.

Non-commercial improvement cutting
This is recommended in areas that are predominantly saplings or small pole-sized trees that are on average or better sites, with high stocking, acceptable growing stock at least 40% of the maximum stocking level, and good accessibility. The goal is to improve the future composition of the stand to make sure that some trees of a variety of desirable species and condition survive and grow. This would not produce income, but would require in-house, volunteer, or contracted labor to complete. The typical practice would be to select about 50–70 desirable trees per acre (25-50 feet apart) and release them by cutting the 3 or 4 trees directly adjacent to them, ignoring all other trees. Any extra stump sprouts, dead low limbs or vines would also be removed from the crop trees. If not practical to cut competing trees with a chainsaw, injection with herbicide or manual cutting are alternative methods for getting the work done.

Thinning
Thinning to promote the growth, vigor and health of the best trees is recommended in large pole and small sawtimber stands that are on average or better sites, are highly stocked, have sufficient volume for a commercial sale, and would have sufficient residual acceptable growing stock after thinning. The trees removed would typically be less desirable and over-represented species and damaged or poorly formed trees.

After thinning, an adequately stocked stand (60 – 75 sq. ft. of basal area, depending on site quality) comprised of a diverse mix of tree species with future value for wildlife and wood products should be left behind. The trees removed could be used for firewood or pulpwood, though there could be a few low-grade sawlogs. A commercial logging contractor would normally carry out the thinning. While thinnings would generate income, they are not very lucrative. The primary benefit is the improvement of the growth, condition, health and future value of the forest.

Selective Harvest

A selective harvest is normally recommended for sawtimber stands that are on average or better sites, highly stocked, have sufficient volume for a commercial sale, and would have sufficient residual acceptable growing stock after harvest. Since it has limited value in regenerating or improving the condition of the even-aged forest found on almost all of the Watershed, it is generally reserved for the more visually or environmentally sensitive sites such as moderately steep slopes. Selective harvests tend to favor the regeneration and development of red maple and black gum, two low-value species that are already too common on the Watershed, so this harvest method should not be over-used. A selective harvest would typically utilize a few of the larger trees and some of the smaller, less desirable trees, and strive to leave behind an adequately stocked stand with conditions for the health and growth of a variety of desirable tree species.

Regeneration Harvest

Regeneration harvests are generally recommended for stands that meet one of the following three conditions: 1) mature stands, 2) poor quality stands with a low amount of acceptable growing stock, or 3) stands that may be immature and acceptable, but are to be regenerated to add diversity to the tree size and species found in a given area. In any case there must be sufficient volume for a commercial harvest. Most of the species found on the Watershed with significant value for wildlife and timber production (oaks, yellow-poplar, black cherry, white ash, aspen, pines) require extensive sunlight to regenerate successfully, and this is provided through a regeneration harvest. The exact type of regeneration harvest to be used in a given stand should be left to the judgment of the Forester, taking into account the specific needs and limitations of that stand and the means available for accomplishing the practice at that particular time and place. Some types of regeneration harvests that may be used include:

> Modified Clearcut Harvest – This practice removes almost all of the trees in that stand over a certain size, such as 2 inches in diameter. Scattered large trees, particularly den trees and nut trees, are often left behind to provide nesting cavities, food and structural diversity for wildlife. This basic method was used extensively on the Watershed following the mortality that followed the gypsy moth infestation to reduce fire hazard, salvage the usable timber and create conditions for regeneration of desirable trees. The success of that effort is evidenced by the increased proportion of oak in the harvested areas compared to the complete absence of oak regeneration in adjacent un-harvested areas.

This method is best used in fairly small stands where regeneration of pine, yellow-poplar, or aspen is needed, or where American chestnut is to be re-introduced.

Deferred Rotation Harvest – This is similar to the modified clearcut harvest described above, with an increased number of large trees left behind, though still creating open sunny conditions on the forest floor. The presence of the remaining large trees reduces the visual impact of the harvest, and provides for satisfactory conditions for regeneration of some shade-intolerant tree species, though less desirable shade-tolerant species may also thrive under these conditions. The large trees left behind could possibly be removed in a later harvest (at least 25 years) once the stand reaches the need for a thinning.

Seed Tree Harvest – This is similar to the modified clearcut method, with the difference being that only about 10 large trees per acre are left behind, and these trees are of certain desirable species that produce wind-disseminated seeds and require full sunlight for regeneration, such as pines. Control of the groundcover and understory vegetation through prescribed burning, herbicide application, or mechanical means may be needed to create conditions for seedling establishment and development. On the Watershed, this may be used in regeneration of the hard pines (pitch pine, Table Mountain pine, Virginia pine, shortleaf pine) that currently exist in a few locations as large scattered mature trees without any reproduction.

Shelterwood Harvest – In this method initially all trees are cut except a significant number of large trees (about 15-30 per acre) with well-developed crowns, of certain desirable species that produce heavy seeds - such as oaks and hickories. The trees left are usually among the largest and most valuable in the stand. Control of the groundcover and understory vegetation through prescribed burning, herbicide application, or mechanical means may be needed to create conditions for seedling establishment and development. This initial harvest should be timed to occur in fall or winter in a year when a heavy acorn/nut crop occurs. Once the canopy is opened up and the soil disturbed, the acorns and nuts can germinate and grow. The new seedlings are allowed to grow and develop for several years, and then the remaining overstory trees are removed to allow the new trees the opportunity to grow. The products removed during the initial cut are typically firewood or pulpwood, along with some sawlogs, and would be similar in value to a thinning or selective harvest. During the final harvest, the scattered large trees that are removed are often valuable and easy to sell, provided the harvest area is large enough. The shelterwood method should be frequently used on the Watershed to regenerate stands that have a good proportion of oaks and hickory.

Prescribed Burning

Prescribed burning is the burning of wildland fuels under specific environmental conditions, confined to a predetermined area, to attain planned resource management objectives. This practice could be used on the Watershed to reduce wildfire risk, prepare sites for natural or planted regeneration of conifers, or reduce the regeneration and development of red maple and black gum while favoring the regeneration of oaks. Fire has long played a role in the development of the forest historically found on the Watershed, and prescribed burning could re-create some of these same effects. Obviously, any fire in the forest is a cause for concern, both for practical and public relations reasons. The main concerns are smoke and the risk of an escaped fire. Smoke on the mountain could be seen from many miles away, and the emergency communications center would probably receive numerous calls. Smoke also has the potential for contributing to poor air quality and creating localized visibility problems. An escaped fire could damage adjacent forest and require time and resources to extinguish. All prescribed fires require a prescribed burning plan be approved by the Maryland DNR Forest Service, stating the conditions under which the burning would take place and the measures and resources that are to be used to assure that it is controlled. The Maryland DNR Forest Service is able to plan and conduct prescribed burning operations for a fee. There is also the likelihood of questions and complaints from the public, since the majority of people are not aware of the potential positive effects of prescribed burning, and have been educated to think that all fire in the forest is bad. In short, carefully done, prescribed burning would be good for the forest but could be controversial. The approach that is provided in the recommendations for the Watershed is to do a few fairly small prescribed burns for pine regeneration over a period of years in the more remote portions of the property. If this works out well, and a level of confidence is reached, the practice could be applied in other areas.

WAYS AND MEANS TO ACCOMPLISH THESE PRACTICES

Commercial Harvest

To a large extent the silvicultural recommendations in this plan are limited to those practices that can be carried out commercially, i.e., harvesting of wood products that will generate income for the City rather than costing the city money to pay personnel or contractors to carry out the practices. In a few cases it may be a break-even situation where the improvement work needed is equivalent to the small value of the wood removed. Many of the trees harvested, especially the smaller and poorest quality trees, could be used for pulpwood by Glatfelter Paper Company in Spring Grove, PA, or MeadWestvaco in Westernport, MD. Commercial firewood operators, some of whom can utilize large volumes of wood, can harvest and sell many of the same small and poor quality trees. The possibility exists to sell small lots to local residents for firewood, as was done previously, but supervising this very time-consuming, and should be avoided if possible. Unfortunately the majority of the trees that would be removed in thinnings are red maple and black gum, which have less value for firewood than oaks, and black gum is extremely difficult to split. In some areas there are downed dead oak trees that resulted from the gypsy moth damage, which may still be

sound enough to use for firewood, and this could make thinning that area more attractive to a commercial firewood operator. The larger trees, over 16 inches in diameter at breast height (dbh), would be used for sawlogs for producing lumber. There are several small sawmills in the local area that may utilize timber from the smaller stands, and a number of larger mills elsewhere in MD, PA and VA that could purchase the larger and more valuable tracts.

Reserve Fund

Income generated from the sale of forest products, either in whole or in part, could be set aside in a "reserve fund" to pay for needed activities. Some examples of these include non-commercial forest improvement practices, habitat improvement, prescribed burning, tree planting, recreational trail stabilization or relocation, boundary marking, educational activities, and the control of insects, diseases or invasive exotic plant species.

Cost-Share and Grants

While existing Maryland and Federal cost-share programs (FLEP, WIP) cannot be used on public lands such as the Watershed, there is a possibility for obtaining grant funds for certain non-commercial activities, especially if volunteers are used and water quality and forest health issues are addressed. Potomac Conservancy, a non-profit conservation organization, has expressed an interest in seeking grant funds for this type of project.

Volunteers, Students, AmeriCorps

Volunteers, either as individuals or as part of conservation and recreation organizations, can be utilized for certain activities. They are most likely to be willing to assist with projects that relate to their particular interests, e.g., hikers and mountain bikers for trail improvements, fishermen for stream protection, hunters and bird watchers for wildlife habitat improvement. For silvicultural activities, some potential "volunteers" would be college students and AmeriCorps. Penn State University at Mont Alto (North of Waynesboro, PA about 28 miles northwest of the Watershed) has an excellent forestry school. This school offers an Associate Degree in Forest Technology, also is also used as the first two years of a Bachelor of Science Degree in Forest Science for students who transfer to the main campus at State College, PA. While this school already has sites on public lands in PA that they use for field activities, the possibility exits that these students could mark and carry out a limited amount of non-commercial improvement work as part of their education. AmeriCorps is a national program, similar to the Civilian Conservation Corps (CCC) that once worked extensively on the Watershed, which employs young adults to work on various social, conservation and cultural projects. AmeriCorps, through the Maryland Conservation Corps (MCC), and the National Civilian Conservation Corps (NCCC), works cooperatively with Maryland DNR and other organizations on forest fire fighting, tree planting, and various other conservation projects. There is usually some compensation expected from the sponsoring organization. It may be practical to arrange for a crew from AmeriCorps to assist with the occasional tree planting project, prescribed burning,

trail improvement and stabilization, and non-commercial improvement cuttings in sapling-sized stands.

Frederick City Watershed
Acres by Compartment, Stand, and Type (Forest or Field)

Compartment	Stand	Acres	Compartment	Stand	Acres
1	1.1	29	**3**	3.1	279
	1.2	24		3.2	29
	1.3	8		3.3	39
	1.4	24		3.4	171
	1.5	24		3.5	26
	1.6	11		3.6	186
	1.7	13		3.7	76
	1.8	44		3.8	57
	1.9	51	forest total	^	863
	1.10	16		fields	0
	1.11	21	total area	^	863
	1.12	96			
	1.13	13	**4**	4.1	105
	1.14	45		4.2	88
	1.15	168		4.3	98
	1.16	54		4.4	52
	1.17	58		4.5	17
	1.18	24	forest total	^	360
	1.19	37		fields	5
	1.20	15	total area	^	365
	1.21	17			
	1.22	24			
	1.23	143	**5**	5.1	34
forest total	^	959		5.2	70
	fields	4		5.3	34
total area	^	963		5.4	15
				5.5	79
				5.6	39
2	2.1	24		5.7	57
	2.2	26		5.8	7
	2.3	15		5.9	32
	2.4	60		5.10	150
	2.5	42		5.11	31
	2.6	42		5.12	65
	2.7	118		5.13	100
	2.8	26		5.14	3
	2.9	76		5.15	42
	2.10	82	forest total	^	758
	2.11	37		fields	1
	2.12	132	total area	^	759
	2.13	47			
forest total	^	727			
	fields	0			
total area	^	727			

Compartment	Stand	Acres
6	6.1	91
	6.2	149
	6.3	68
	6.4	103
	6.5	20
	6.6	40
	6.7	58
	6.8	18
	6.9	121
	6.10	37
forest total	^	705
	fields	0
total area	^	705
7	7.1	48
	7.2	172
	7.3	16
	7.4	87
	7.5	116
	7.6	5
	7.7	23
	7.8	79
	7.9	50
	7.10	43
forest total	^	639
	fields	0
total area	^	639
8	8.1	56
	8.2	84
	8.3	61
	8.4	128
	8.5	60
	8.6	164
	8.7	180
	8.8	39
	8.9	6
	8.10	68
forest total	^	846
	fields	1
total area	^	847

Compartment	Stand	Acres
9	9.1	139
	9.2	57
	9.3	28
	9.4	36
	9.5	66
	9.6	35
	9.7	39
	9.8	13
	9.9	129
	9.10	309
	9.11	232
	9.12	66
forest total	^	1149
	fields	5
total area	^	1154

Totals	
# of Stands	**106**
Forest Acres	**7006**
Field Acres	**16**
Total Acres	**7022**

Stand Descriptions and Recommended Practices

DEFINITION OF TERMS - abbreviated

STAND #: The number indicates the compartment # and stand #. A stand is the basic forest management unit, indicating a geographical grouping of trees that is similar in species composition, age arrangement and condition, and will be managed in the same manner.

FOREST TYPE: A general description of the species makeup of the stand.

DEVELOPMENT STAGE: The size class of the trees that is predominant in the stand. These classes include:

Seedling - Less than 1" DBH (Diameter at Breast Height - measured 4 1/2 feet above ground level)
Sapling - 1" to 5.9" DBH
Pole - 6" to 10.9" DBH
Sawtimber - 11" DBH and larger

STOCKING: The relative density of the trees. This takes into consideration the number of trees per acre, the sizes of the trees, and the maximum density that the site can support for the species found there.

% EXISTING TREES DESIRABLE OR UNDESIRABLE: The percentage of the existing trees that are desirable or undesirable for the objectives for the property. Desirability of a tree may be based on the form and condition of the tree (e.g., healthy and straight vs. stunted, crooked, broken, or decayed), and the species.

SITE GROWTH POTENTIAL: The inherent capacity of the site due to soils, moisture conditions and topography. This is expressed in the terms: excellent, good, average, fair, poor. It is based on site index, which is derived from the typical height a dominant tree reaches at age 50 on that site. The site indices are based on upland oaks unless indicated otherwise.

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 1

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
1.1	29	Mixed Hardwoods	Pole	High	65%	35%	Average	No silvicultural work needed.
1.2	24	Mixed Hardwoods	Sapling	Adequate	85%	15%	Good	Non-commercial improvement cutting in 6 years (2011).
1.3	8	Mixed Hardwoods	Pole	Very High	60%	40%	Average	No silvicultural work needed.
1.4	24	Mixed Hardwoods	Pole	Adequate	75%	25%	Average	No silvicultural work needed.
1.5	24	Upland Oaks	Pole	Adequate	63%	37%	Average	No silvicultural work needed.
1.6	11	Mixed Hardwoods	Pole	Adequate	72%	28%	Average	No silvicultural work needed.

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
1.7	13	Oak/Mixed Hardwoods	Pole	Adequate	56%	44%	Average	No silvicultural work needed.
1.8	44	Oak/Mixed Hardwoods	Pole	Adequate	66%	34%	Average	Non-commercial improvement cutting in 8 years (2013).
1.9	51	Oak/Mixed Hardwoods	Pole	Adequate	55%	45%	Fair	Site preparation and regeneration in 6 years (2011).
1.10	16	Mixed Hardwoods	Pole	Adequate	43%	57%	Fair	No silvicultural work needed.
1.11	21	Upland Oaks	Pole	Adequate	58%	42%	Fair	No silvicultural work needed.
1.12	96	Mixed Hardwoods	Pole	Adequate	53%	47%	Average	Non-commercial improvement in 4 years (2009).
1.13	13	Oak/Mixed Hardwoods	Pole	High	80%	20%	Fair	No silvicultural work needed.

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
1.14	45	Oak-Mixed Hardwoods	Pole	Low	60%	40%	Fair	No silvicultural work needed.
1.15	168	Mixed Hardwoods	Pole	Adequate	74%	26%	Fair	Regeneration harvest in 16 years (2021).
1.16	54	Mixed Hardwoods	Pole	Adequate	57%	43%	Fair	Site preparation and regeneration (2006).
1.17	58	Mixed Hardwoods	Sapling	Adequate	70%	30%	Fair	No silvicultural work needed.
1.18	24	Mixed Hardwoods	Pole	Adequate	42%	58%	Fair	No silvicultural work needed.
1.19	37	Mixed Hardwoods	Pole	Adequate	42%	58%	Fair	No silvicultural work needed.
1.20	15	Upland Oaks	Pole	High	66%	34%	Fair	Regeneration harvest in 10 years (2015).

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
1.21	17	Mixed Hardwoods	Sapling	Adequate	52%	48%	Fair	No silvicultural work needed.
1.22	24	Mixed Hardwoods	Sapling	Adequate	44%	56%	Fair	No silvicultural work needed.
1.23	143	Mixed Hardwoods	Pole	Adequate	62%	38%	Poor	No silvicultural work needed.

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 2

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
2.1	24	Mixed Hardwoods	Pole	Adequate	51%	49%	Fair	No silvicultural work needed.
2.2	26	Mixed Hardwoods	Sapling	Adequate	46%	54%	Fair	Non-commercial improvement cutting in 4 years (200).
2.3	15	Mixed Hardwoods	Small saw-timber	Adequate	44%	56%	Average	No silvicultural work needed.
2.4	60	Mixed Hardwoods	Pole	Adequate	45%	55%	Good	No silvicultural work needed.
2.5	42	Mixed Hardwoods	Sapling	Very High	60%	40%	Good	Non-commercial improvement cutting (2006).
2.6	42	Chestnut Oak	Pole	Adequate	72%	28%	Fair	No silvicultural work needed.

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
2.7	118	Mixed Hardwoods	Pole	Adequate	45%	55%	Average	No silvicultural work needed.
2.8	26	Mixed Hardwoods	Pole	Adequate	30%	70%	Fair	No silvicultural work needed.
2.9	76	Upland Oaks	Pole	Adequate	63%	37%	Poor	No silvicultural work needed.
2.10	82	Oak-Mixed Hardwoods	Pole	High	41%	59%	Average	No silvicultural work needed.
2.11	37	Tulip Poplar/ Hemlock	Small saw-timber	Adequate	47%	53%	Average	No silvicultural work needed except hemlock restoration.
2.12	132	Upland Oaks	Small saw-timber	High	51%	49%	Average	No silvicultural work needed.
2.13	47	Upland Oaks	Small saw-timber	High	64%	36%	Average	No silvicultural work planned.

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 3

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
3.1	279	Oak-Mixed Hardwoods	Pole	Adequate	49%	51%	Good	Thinning in 14 years (2019).
3.2	29	Mixed Hardwoods	Pole	Very High	41%	59%	Good	Regeneration harvest in 8 years (2013).
3.3	39	Mixed Hardwoods	Pole	Adequate	58%	42%	Average	No silvicultural work needed.
3.4	171	Mixed Hardwoods	Pole	Adequate	44%	56%	Good	Thinning in 12 years (2017).
3.5	26	Oak-Mixed Hardwoods	Pole	Very High	49%	51%	Good	Thinning in 8 years (2013).
3.6	186	Yellow-Poplar/ Mixed Hardwoods	Small Saw-timber	Adequate	58%	42%	Good	Selective harvest in 18 years (2023).

Stand #	**Area Acres**	**Forest Type**	**Development Stage**	**Stocking**	**% Des. Trees**	**% Undes. Trees**	**Site Growth Potential**	**Recommendations and Practices**
3.7	76	Upland Oaks	Small Saw-timber	High	60%	40%	Good	No silvicultural work planned except hemlock restoration.
3.8	57	Upland Oak	Small saw-timber	Adequate	51%	49%	Average	No silvicultural work planned except hemlock restoration.

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 4

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
4.1	105	Yellow-Poplar/Mixed Hardwoods	Small Saw-timber	Adequate	72%	28%	Good	No silvicultural work planned except hemlock restoration.
4.2	88	Oak/Mixed Hardwoods	Large Saw-timber	Adequate	62%	38%	Excellent	No silvicultural work planned.
4.3	98	Oak/Mixed Hardwoods	Pole	Adequate	58%	42%	Average	No silvicultural work needed.
4.4	52	Oak/Mixed Hardwoods	Pole	High	66%	34%	Average	No silvicultural work needed.
4.5	17	Mixed Hardwoods	Pole	High	57%	43%	Average	Non-commercial improvement in 3 years (2008).

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 5

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
5.1	34	Upland Oaks	Pole	Adequate	78%	22%	Average	No silvicultural work needed.
5.2	70	Upland Oaks	Pole	High	73%	27%	Excellent	Thinning in 18 years (2023).
5.3	34	Mixed Hardwoods	Small Saw-timber	Adequate	67%	33%	Good	No silvicultural work planned.
5.4	15	Upland Oaks	Pole	High	59%	41%	Good	Thinning in 16 years (2021).
5.5	79	Mixed Hardwoods	Small Saw-timber	Adequate	52%	48%	Good	Thinning in 6 years (2011).
5.6	39	Mixed Hardwoods	Small Saw-timber	Adequate	68%	32%	Good	No silvicultural work planned.

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
5.7	57	Oak/Mixed Hardwoods	Pole	High	78%	22%	Average	Non-commercial improvement in 2 years (2007).
5.8	7	Red Pine/ Mixed Hardwoods	Small Saw-timber	Adequate	65%	35%	Good	Regeneration harvest in 12 years (2019).
5.9	32	Chestnut Oak	Pole	High	81%	19%	Average	Thinning in 12 years (2017).
5.10	150	Mixed Oaks	Small Saw-timber	High	82%	18%	Good	Selective harvest in 10 years (2015).
5.11	31	Oak/Mixed Hardwoods	Small saw-timber	Adequate	51%	49%	Average	No silvicultural work needed.
5.12	65	Mixed Hardwoods	Small saw-timber	High	49%	51%	Good	Selective harvest in 4 years (2009).
5.13	100	Oak/Mixed Hardwoods	Pole	High	66%	34%	Average	Thinning in 8 years (2013).

Stand #	**Area Acres**	**Forest Type**	**Development Stage**	**Stocking**	**% Des. Trees**	**% Undes. Trees**	**Site Growth Potential**	**Recommendations and Practices**
5.14	3	Red Pine	Small saw-timber	Very High	60%	40%	Average	Regeneration harvest in 12 years (2017).
5.15	42	Upland Oaks	Pole	Very High	46%	54%	Fair	No silvicultural work needed.

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 6

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
6.1	91	Oak/Mixed Hardwoods	Small Saw-timber	High	70%	30%	Average	No silvicultural work planned.
6.2	149	Upland Oaks	Pole	High	77%	33%	Average	Thinning in 13 years (2018).
6.3	68	Upland Oaks	Small Saw-timber	High	87%	13%	Average	Thinning in 9 years (2014).
6.4	103	Upland Oaks	Pole	Adequate	65%	35%	Fair	Thinning in 17 years (2022).
6.5	20	Upland Hardwoods	Small Saw-timber	Adequate	67%	33%	Good	No silvicultural work needed.
6.6	40	Oak/Mixed Hardwoods	Pole	Adequate	74%	26%	Fair	No silvicultural work needed.

Stand #	**Area Acres**	**Forest Type**	**Development Stage**	**Stocking**	**% Des. Trees**	**% Undes. Trees**	**Site Growth Potential**	**Recommendations and Practices**
6.7	58	Oak/Mixed Hardwoods	Small Saw-timber	High	65%	35%	Fair	Regeneration harvest in 11 years (2016).
6.8	18	Oak/Mixed Hardwoods	Small Saw-timber	Adequate	77%	23%	Fair	No silvicultural work needed.
6.9	121	Upland Oaks	Small Saw-timber	High	97%	3%	Fair	Selective harvest in 7 years (2012).
6.10	37	Oak/Mixed Hardwoods	Pole	High	65%	35%	Fair	No silvicultural work needed.

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 7

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
7.1	48	Yellow-Poplar Mixed Hardwoods	Small Saw-timber	Adequate	81%	19%	Average	No silvicultural work planned.
7.2	172	Oak-Mixed Hardwoods	Pole	Adequate	67%	33%	Fair	No silvicultural work needed.
7.3	16	Mixed Hardwoods	Pole	Very High	63%	37%	Average	Regeneration harvest in 2 years (2007).
7.4	87	Upland Oaks	Pole	High	94%	6%	Fair	No silvicultural work needed.
7.5	116	Upland Oaks	Small Saw-timber	High	97%	3%	Fair	Regeneration harvest in 10 years (2015).
7.6	5	Upland Oaks	Large Saw-timber	High	99%	1%	Excellent	Regeneration harvest in 4 years (2009).

Stand #	**Area Acres**	**Forest Type**	**Development Stage**	**Stocking**	**% Des. Trees**	**% Undes. Trees**	**Site Growth Potential**	**Recommendations and Practices**
7.7	23	Upland Oaks	Small Saw-timber	Very High	99%	1%	Fair	No silvicultural work planned.
7.8	79	Oak/Mixed Hardwoods	Small Saw-timber	Adequate	67%	33%	Fair	Selective harvest in 4 years (2009).
7.9	50	Upland Oaks	Small Saw-timber	Very High	96%	4%	Average	No silvicultural work planned.
7.10	43	Upland Oaks	Pole	Very High	76%	24%	Good	Thinning in 2 years (2007).

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 8

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
8.1	56	Mixed Hardwoods	Small Saw-timber	Adequate	99%	1%	Fair	No silvicultural work planned.
8.2	84	Upland Oaks	Small Saw-timber	Very High	98%	2%	Good	Thinning (2006).
8.3	61	Oak/Mixed Hardwoods	Pole	Adequate	99%	1%	Good	Thinning in 19 years (2024).
8.4	128	Oak/Mixed Hardwoods	Pole	High	99%	1%	Fair	No silvicultural work needed.
8.5	60	Oak/Mixed Hardwoods	Small Saw-timber	Adequate	99%	1%	Fair	Selective harvest in 15 years (2020).
8.6	164	Upland Oaks	Small Saw-timber	Very High	95%	5%	Average	Thinning in 9 years (2014).

Stand #	**Area Acres**	**Forest Type**	**Development Stage**	**Stocking**	**% Des. Trees**	**% Undes. Trees**	**Site Growth Potential**	**Recommendations and Practices**
8.7	180	Upland Oaks	Pole	Adequate	97%	3%	Fair	No silvicultural work needed.
8.8	39	Upland Oaks	Pole	Adequate	99%	1%	Fair	No silvicultural work needed.
8.9	6	Oak/Mixed Hardwoods	Pole	Adequate	99%	1%	Good	Regeneration harvest in 19 years (2024).
8.10	68	Upland Oaks	Small saw-timber	Adequate	96%	4%	Average	Thinning in 13 years (2018).

STAND DESCRIPTION AND RECOMMENDED PRACTICES

COMPARTMENT 9

Stand #	Area Acres	Forest Type	Development Stage	Stocking	% Des. Trees	% Undes. Trees	Site Growth Potential	Recommendations and Practices
9.1	139	Oak/Mixed Hardwoods	Small Saw-timber	High	95%	5%	Fair	No silvicultural work planned.
9.2	57	Upland Oaks	Pole	Adequate	79%	21%	Fair	No silvicultural work needed.
9.3	28	Mixed Hardwoods	Pole	Adequate	80%	20%	Fair	No silvicultural work needed.
9.4	36	Oak/Mixed Hardwoods	Pole	High	80%	20%	Fair	No silvicultural work needed.
9.5	66	Oak/Mixed Hardwoods	Pole	High	79%	21%	Average	Thinning in 18 years (2023).
9.6	35	Mixed Hardwoods	Pole	Adequate	60%	40%	Average	Non-commercial improvement cutting in 6 years (2011).

Stand #	**Area Acres**	**Forest Type**	**Development Stage**	**Stocking**	**% Des. Trees**	**% Undes. Trees**	**Site Growth Potential**	**Recommendations and Practices**
9.7	39	Upland Oaks	Pole	High	93%	7%	Average	Thinning in 12 years (2017).
9.8	13	Upland Oaks	Small Saw-timber	Adequate	92%	8%	Good	No silvicultural work needed.
9.9	129	Upland Oaks	Pole	Very High	90%	10%	Average	Thinning in 4 years (2009).
9.10	309	Oak/Mixed Hardwoods	Pole	Adequate	98%	2%	Fair	Site-preparation and regeneration in portions of stand starting in about 8 years (2013).
9.11	232	Upland Oaks	Pole	High	98%	2%	Good	Thinning in 18 years (2023).
9.12	66	Upland Oaks	Small Saw-timber	High	96%	4%	Good	Selective harvest in 10 years (2015).

MANAGEMENT PRACTICE SCHEDULE

Frederick City Watershed
General Activities for Entire Property

COMPLETION DATE	PRACTICE		Compartment
2005	Control of invasive alien plants along roadsides & fields		All
2005	Boundary marking		4
2005	Hemlock treatment for adelgid		3, 4
2005	Review road problems with Frederick County Roads		All
2006	Control of invasive alien plants along roadsides & fields		All
2006	Boundary marking		4 & 5
2006	Hemlock treatment for adelgid – continue as needed		3, 4
2006	Catoctin (Blue) Trail re-alignment and repair		1, 2, 3
2007	Control of invasive alien plants along roadsides & fields		All
2007	Boundary marking		6
2007	Catoctin (Blue) Trail re-alignment and repair		6, 7, 8, 9
2008	Stoner Road re-alignment and repair		6, 7
2008	Boundary marking		7
2009	Boundary marking		8
2010	Boundary marking		9
2011	Boundary marking		1 & 2
2015	Begin annual boundary remarking & maintenance		one compartment per year

Schedule of Silvicultural Activities is provided on following pages

MANAGEMENT PRACTICE SCHEDULE

Frederick City Watershed

Composite Schedule for Silvicultural Activities in all Compartments

COMPLETION DATE	PRACTICE	STAND	ACRES
2006	Site preparation and regeneration	1.16	54
2006	Non-commercial improvement cutting	2.5	42
2006	Thinning	8.2	84
2007	Non-commercial improvement cutting	5.7	58
2007	Site preparation and regeneration	7.3	16
2007	Thinning	7.10	43
2008	Non-commercial improvement cutting	4.5	17
2009	Non-commercial improvement cutting	1.12	96
2009	Non-commercial improvement cutting	2.2	26
2009	Selective harvest	5.12	65
2009	Regeneration harvest	7.6	5
2009	Selective harvest	7.8	79
2009	Thinning	9.9	129
2011	Non-commercial improvement cutting	1.2	24
2011	Site-preparation and regeneration	1.9	51
2011	Thinning	5.5	79
2011	Non-commercial improvement cutting	9.6	35
2012	Selective harvest	6.9	121
2013	Non-commercial improvement cutting	1.8	44
2013	Non-commercial improvement cutting	1.21	17
2013	Regeneration harvest	3.2	29

- continued on next page -

MANAGEMENT PRACTICE SCHEDULE

Frederick City Watershed

Composite Schedule for Silvicultural Activities in all Compartments - Continued

COMPLETION DATE	PRACTICE	STAND	ACRES
2013	Thinning	3.5	26
2013	Thinning	5.13	100
2013	Site-preparation and regeneration	9.10	309
2014	Thinning	6.3	68
2014	Thinning	8.6	165
2015	Regeneration harvest	1.20	15
2015	Selective harvest	5.10	150
2015	Regeneration harvest	7.5	116
2015	Selective harvest	9.12	66
2016	Regeneration harvest	6.7	58
2017	Thinning	3.4	171
2017	Regeneration harvest	5.8	10
2017	Thinning	5.9	32
2017	Regeneration harvest	5.14	10
2017	Thinning	9.7	39
2017	Collect data and revise plan for Compartment 1	All	959
2018	Thinning	6.8	149
2018	Thinning	8.10	68
2018	Collect data and revise plan for Compartment 2	All	727

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MANAGEMENT PRACTICE SCHEDULE

Frederick City Watershed

Composite Schedule for Silvicultural Activities in all Compartments - Continued

COMPLETION DATE	PRACTICE	STAND	ACRES
2019	Thinning	3.1	279
2019	Collect data and revise plan for Compartment 3	All	863
2020	Selective harvest	8.5	60
2020	Collect data and revise plan for Compartment 4	All	360
2021	Regeneration harvest	1.15	168
2021	Thinning	5.4	15
2021	Collect data and revise plan for Compartment 5	All	758
2022	Thinning	6.4	103
2022	Collect data and revise plan for Compartment 6	All	705
2023	Selective harvest	3.6	186
2023	Thinning	5.2	70
2023	Thinning	9.5	66
2023	Thinning	9.11	232
2023	Collect data and revise plan for Compartment 7	All	639
2024	Thinning	8.3	62
2024	Regeneration harvest	8.9	6
2024	Collect data and revise plan for Compartment 8	All	846
2025	Collect data and revise plan for Compartment 9	All	1149
2025	Complete Revised Forest Stewardship Plan	All	7006